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AUGUST 1958

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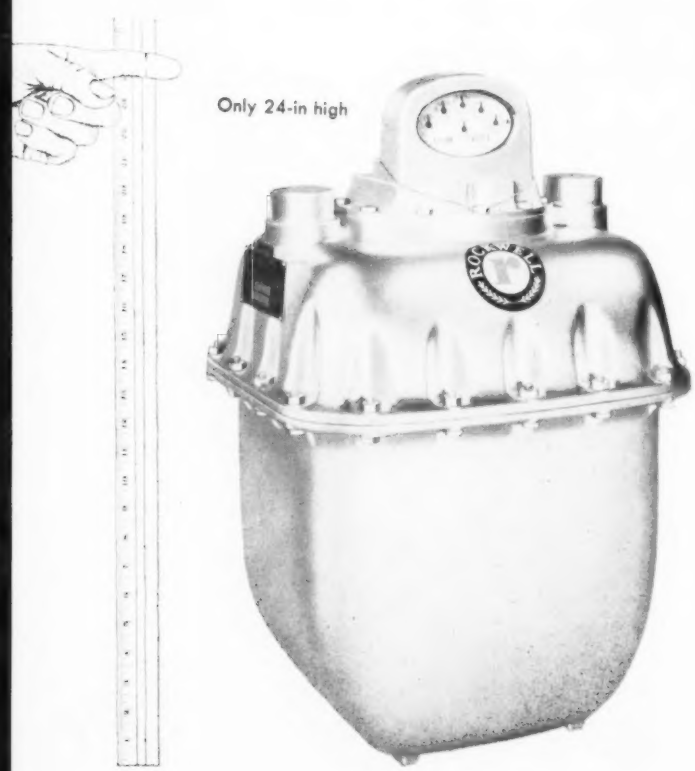

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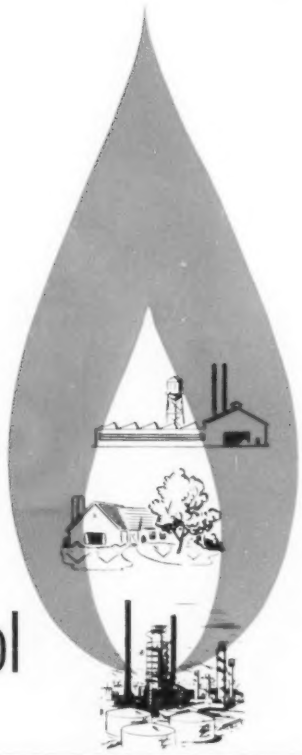

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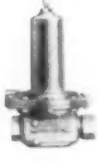

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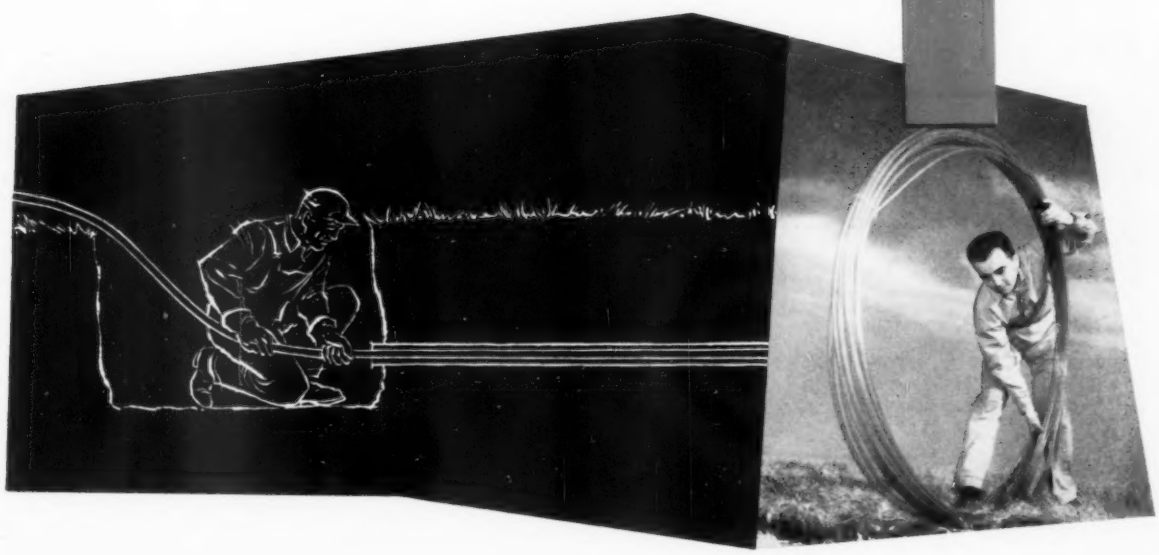

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34TH YEAR OF PUBLICATION

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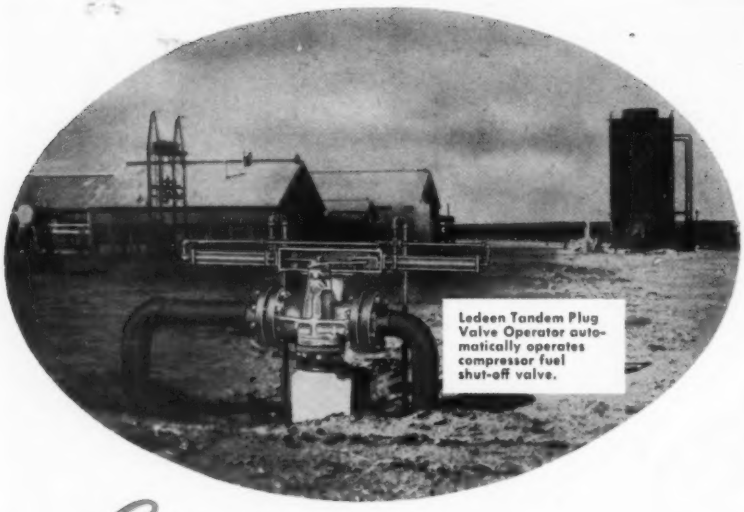

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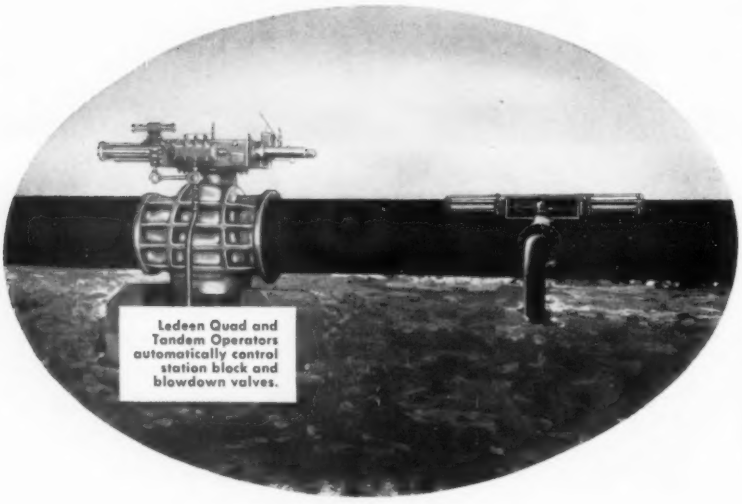

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198 S. Alvarado St., Los Angeles 57
Tel. DUnkirk 7-4337

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Don Wright, Managing Editor
William W. Clark, Eastern Editor
Barbara Hall, Assistant Editor

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Neil Regeimbal, Washington Editor
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AUGUST 1958

Thermally Thinking

ASSOCIATIONS are well accepted parts of our business and industrial life. I suppose their main objectives are service and support to the industrial group with which they are aligned. Some of them do these things well; but, others do not. From my own observations, there are industrial associations that get their objectives all tangled up. Then, one sees an association that spends most of its time and talents obtaining service and support from its industry for itself.

How fortunate we are in the gas industry to have an able association representing our industry on the national level. The American Gas Association seems to be at least a cut or two above most industrial associations. It is a strong group, it has a fine staff, it does serve and support the gas industry, and it is an association that I think our industry is proud of.

I doubt that AGA is perfect. I also doubt that your gas company is perfect and I know that GAS Magazine is not. None of us are without faults, which is certainly no news to human beings. However, when the positive far outweighs the negative on the scale of good judgment, then we have a good man, a good company, or a good association.

I suggest that each person making his living from the gas industry read in detail the booklet delineating the annual reports of AGA and PAR for 1957. Then, I think, one can refresh his realization of the value of this association to the gas industry.

This report was, of course, prepared by the American Gas Association. And I know that the people who prepared it would be among the last to come right out and say that they are a bunch of bums. But I think careful readers who have followed the progress of the gas industry during 1957 will agree with me when I say the report is actually conservative in crediting accomplishments to AGA and its staff members. I hope that gas industry people will be just as charitable when passing out "credit" for some of the failures of the gas industry during recent times.

Some gas industry companies and segments do not belong to AGA. So be it. I try pretty hard not to fall into the trap that snares many newspaper and magazine editors when they try to tell people, companies and agencies what they should or should not do. Therefore, I submit that gas companies which do not support our industry's national association know what they are doing and have valid reasons, from their own position and ambitions, for not doing so. I figure that if I knew how to really run a gas company, I would be doing so. It is my sad mission to report that bids for my services as president of a gas company have been somewhat less than a flood—in fact, zero.

But I do offer the premise that non-supporting companies might do well to reappraise their decisions periodically. And I think such companies and segments of the industry will profit if this reappraisal is made rather scientifically, with complete disregard of pressures, prejudices and platitudes. The gas industry's producers, pipeliners, distributors and manufacturers have grown closer together than ever before. But throwing away the grammar book and reluctantly ducking behind an editorial license, I will say to each of these groups: Brother, you still got a long way to go.

It is easy to get our Congress or the Judiciary to settle disputes within the gas industry. But once they are in, you certainly have a hard time ever getting them out. I have said it before and I say it again, Washington is not the place to air out this industry's dirty wash. Such debate damages the gas industry en bloc' and damages the best interests of the millions of current and future gas customers. The latter are really important to all of us.

Join in with most of the gas industry to bring your voice before the industry's congress—the AGA. Distributors, producers, manufacturers and pipeliners must work out their problems together. The American Gas Association is the only practical national forum for getting together to work out solutions of our industry's problems. Please use it.

J. Fred Ebsen
EDITOR

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GAS HIGHLIGHTS

Trunkline plans $81 million expansion

Trunkline Gas Co., Houston, has asked FPC for authorization to expand its system to make deliveries to Consumers Power Co., Jackson, Mich. Cost of the project would be $81.5 million, and would provide Consumers with an initial delivery of 135 MMcf/day, ultimately rising to 200 MMcf/day. If FPC approves, Trunkline will build a 204-mile mainline extension from central Illinois to the Indiana-Michigan border, where it will connect with the Consumers system. Pipeline company hopes to start construction by Jan. 1, 1959.

Northern denied Redfield approval

An FPC examiner has denied Northern Natural Gas Co.'s bid for a certificate to permanently operate its Redfield, Iowa, underground storage field. Francis L. Hall concluded that Northern has failed to show that Redfield is "geologically sound, economically feasible, or that it will perform as required for dependable service." Decision is now subject to review by the entire commission.

Texas Gas seeks expansion okay

Texas Gas Transmission Co., Owensboro, Ky., plans a $20 million expansion program which will boost system delivery capacity 113 MMcf/day. The plan, now before FPC, calls for 126 miles of new pipeline and 9040 additional compressor horsepower at existing stations. The new pipeline will loop Texas Gas' existing mainline in Louisiana, Arkansas, Mississippi, Kentucky, Indiana and Illinois.

Florida will get gas next summer

Houston Corp. says it expects to have funds available to start construction of its Texas-to-Florida pipeline sometime this month. This means natural gas will be available throughout the state by next summer. The pipeline—a $226 million project—will be built and operated by Houston Corp.'s two subsidiaries, Coastal Transmission Corp. and Houston Texas Gas & Oil Corp.

Pittsburgh seeks appliance law

Pittsburgh (Pa.) city officials are considering a proposal to give gas company employees the right to condemn unsafe gas appliances. Now before the city council is a proposed ordinance which would give gas company or city inspectors the right to red-tag any unsafe appliance. Once an appliance has been tagged, it could not be used until repaired.

Panhandle renews Detroit market fight

Panhandle Eastern Pipe Line Co. has started another chapter in its running battle with the American Natural Gas system. Panhandle now has asked FPC to reverse a presiding examiner's decision, and allow it to discontinue deliveries to American Natural's Michigan Consolidated Gas Co. (Detroit). Panhandle maintains that continued service to Mich-Con deprives other customers in the Midwest of badly needed gas supplies. The pipeline claims that Mich-Con has ample gas supplies, and does not need the gas it now gets from Panhandle.

New oil burner may stir competition

A Standard Oil Co. of New Jersey subsidiary has developed an oil burner which will sell for 20 per cent less, and is said to be more efficient. Gilbert & Barker Mfg. Co., maker of the new burner, say they feel it is a step in the right direction, but not the answer to gas competition. However, they feel that low cost unit will boost burner sales substantially. Sales efforts will be aimed primarily at the new home market, where oil has been losing ground to gas at a fast rate.

Refiners protest any gas increases

California refiners are lining up against any increased supplies of out-of-state gas to California distribution companies. A spokesman for the Independent Refiners Association of California says that fuel oil consumption in California has dropped 130,000 bbl/day in the past year, and hinted that any increased supplies of natural gas could cause a general price hike for all petroleum products.

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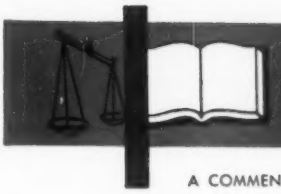


Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

FPC price discretion

AN appellate court has approved a decision by the Federal Power Commission refusing to place an initial price condition on a certificate authorizing producers to sell gas to an interstate pipeline company. This is a landmark case and gives FPC great discretion in attaching conditions or refusing to place conditions upon certificates of public convenience and necessity.

The Natural Gas Pipeline Co. of America, which supplies gas to the Chicago area, applied to FPC for authority to extend its pipeline 350 miles into a new producing area in Texas. Three independent gas producers sought permission from FPC to sell natural gas to the interstate pipeline. The dispute was started by interveners, who objected to the initial price of about 14 cents per Mcf, because the highest prevailing price was 11 cents in the same gas producing area. Certain companies purchasing gas in the area to be tapped by the pipeline extension complained that the "excessive initial price" would result in raising the prices they have to pay for natural gas. The City of Chicago asked FPC to condition the certificate at a price below the contract price, because otherwise the result would be higher consumer rates in Chicago. FPC rejected the requests of the opponents and granted certificates for the pipeline extension and the contracted sale of gas by the three producers.

After this court's blessing, it will be difficult to reverse FPC, unless there is a clear abuse of discretion by the commission in certificate proceedings. The appellate court concluded that there was substantial evidence to support the FPC decision. The court and FPC both mentioned that the commission has continuing regulatory power to prescribe reasonable gas prices when that becomes necessary in a rate proceeding.

Natural Gas Pipeline Co. of America has operated a natural gas pipeline from the Panhandle field in Texas to Joliet, Ill., and, together with its affiliate, Texas Illinois Natural Gas Pipeline Co., supplies the entire natural gas requirements of the metropolitan Chicago area. Natural's existing pipeline, which has a capacity of 510 MMcf/per day, is presently being operated at more than 98 per cent load factor. There is a growing and unsatisfied demand for natural gas in this area. Natural sought to accommodate this demand and, to accomplish this, contracted with three independent producers, Sunray Mid-Continent Oil Co., Warren Petroleum Corp., and Oil Drilling Inc., interveners in this proceeding, to buy at an initial price of 13.9 cents per Mcf the large gas reserves of 78 MMcf per day which those producers had discovered in Jack and Wise counties, Texas.

In October 1954, Natural and its producer-suppliers made applications to the commission for certificates of public convenience and necessity pursuant to the Natural Gas Act. Natural's application sought permission to extend its Chicago-Texas Panhandle pipeline from Fritch, Texas, southeasterly through major gas-producing areas of southern Oklahoma to certain gas fields in the north central part of Texas, a distance of 350 miles. Producers' applications sought permission to sell and deliver their gas to Natural in accordance with their contracts.

Lone Star Gas Co., which had been the sole large buyer of natural gas in northern Texas, filed a rival application under the act. Lone Star proposed to supply 80 MMcf of gas to Natural at Fritch, Texas, through a 230-mile pipeline which would be built from its existing line in Oklahoma.

Oklahoma Natural Gas Co. is, and has been for over 50 years, engaged in the distribution of natural gas in Oklahoma. It serves approximately 335,000 customers and uses approximately 125 billion cu ft of natural gas annually. It now purchases approximately 60 per cent of its required gas supplies in southern Oklahoma at a maximum price of 10 cents per Mcf.

In the proceedings before the commission, permission to intervene in all of the proceedings was granted by the commission to Cities Service Gas Co., Upham Gas Co., Consolidated Gas Utilities Corp., Central Illinois Electric & Gas Co., Iowa Power & Light Co., State Fuel Supply Co., and the City of Chicago, Ill. Natural and Lone Star each were interveners in the proceedings involving the application of the other.

The gas utility interveners opposed the granting of certificates and asked that, if certificates were granted to Producers, such certificates be conditioned on Producers receiving no more than 11 cents per Mcf of gas, which was alleged to be the prevailing price in the area.

After separate hearings on the two proposals, the proceedings were consolidated. The examiner rendered a consolidated decision which rejected the application of Lone Star and approved those of Natural and Producers, subject, however, to a condition which effected a reduction in the initial price to be charged Natural by Producers. The examiner was of the opinion that such a condition was required by the commission's opinion in *In re Cities Service Gas Co., et al.*, 12 PUR 3d 3(1955), which he regarded as controlling and not re-

stricted to the facts in that case.

All parties filed exceptions to the examiner's decision. The commission permitted the proceedings to be reopened for the introduction in evidence of matters that had occurred since the close of the initial hearings. Included were amendments to the contract with Producers reducing their initial price by 1 cent per Mcf with provisions respecting price escalation.

The FPC order again granted the applications of Natural and Producers without any condition as to price, but it did provide:

"The grant of the certificates herein shall not be construed as a waiver of the requirements of Section 4 of the Natural Gas Act, or of Section 154 of the commission's Rules and Regulations thereunder requiring the filing of rate schedules for the service herein authorized, and is without prejudice to any findings or orders which have been or may hereafter be made by the commission in any proceedings now pending or hereafter instituted by or against the applicants. Further, the action taken in this proceedings shall not foreclose nor prejudice any future proceedings or objection relating to the operation of any price or related provision in the gas purchase contracts herein involved."

The commission order again denied Lone Star's application for construction of its proposed facilities. The commission, however, found that there was demand for gas beyond the supply now authorized, and authorized Lone Star to sell to Natural an average daily volume of 80 MMcf of natural gas and a daily maximum of 100 MMcf at the point of intersection between Lone Star's existing pipeline and Natural's proposed line in southern Oklahoma. The commission also required Natural, in the event of Lone Star's acceptance of such authorization, to file with the commission an application for a certificate of public convenience and necessity for facilities necessary to increase the sales capacity of its system between Fritch, Texas, and Joliet, Ill., by 100 MMcf per day. Lone Star accepted the plan, and Natural filed its application pursuant to the commission's order. Only Oklahoma Natural appealed from the commission's decision.

Oklahoma Natural asserted that, in a proceeding for a certificate of public convenience and necessity when the rate is challenged by a party raising a substantial question as to its reasonableness, the Natural Gas Act imposes a mandatory duty on the commission to insure that the proposed rates are just and reasonable.

Oklahoma Natural claimed the record did not support a finding that the increased rate proposed by Producers was "just and reasonable." This error, it asserted, required that the order granting the certificates be set aside since the granting of the certificates resulted in Natural Gas Pipeline's obtaining gas at a higher cost to its customers and, at the same time, results in increased cost to competing utilities by causing an unwarranted advance in the prevailing price in the area.

The involved gas reserve in Jack and Wise counties, Texas, is the largest remaining undedicated gas reserve in the mid-continent area, and one of the largest discovered in the United States in recent years.

A dominant factor in this case is the need for more gas in the Chicago area. The commission found that unsatisfied demands exist in Chicago and are increasing at a phenomenal rate, and the demand in the future will be above the present sales capacity of Natural's existing system of 510 MMcf per day. Natural's need has become more acute by the fact that the Herscher underground storage field in Illinois, which was expected to deliver a daily supply of 1500 MMcf, can be relied on for only 430 MMcf.

• The court's rationale

The appellate court bowed to FPC expertise and gave this written testimonial:

"The statute makes the issuance of a certificate dependent upon a finding of 'public convenience and necessity,' and it delegates to the commission the power and duty to make that finding. The commission, by its expert knowledge of and continuing contact with the natural gas industry, is qualified to make the determinations of fact and the evaluations of policy which the issuance of a certificate requires.

"The granting or denial of a certificate of public convenience and necessity is a matter peculiarly within the discretion of the commission. The commission's action in imposing a price condition on the issuance of a certificate was upheld in Cities Service-Signal Oil *supra;* and in *Sunray Mid-Continent Oil Co. v. Federal Power Com'n,* 239 F.2d 97, 101 (10th Cir. 1956), reversed on other grounds, 353 U. S. 944, in upholding the commission's authority to refute to impose conditions on the issuance of certificates, the court said:

" 'Just as the commission has authority to impose conditions upon the issuance of a certificate so, too, it has authority to refuse to impose conditions.'

"Under Section 7(e) it is provided:

" 'The commission shall have the power to attach to the issuance of the certificate (of public convenience and necessity) and to the exercise of the rights thereunder such reasonable terms and conditions as the public convenience and necessity may require.'

"It is obvious that the plain congressional meaning is to vest the commission with the discretion to attach terms, including rate conditions. It is fitting that there should be this discretion and, in the absence of an abuse of that discretion, courts should not interfere. We find no such abuse here.

"Petitioner contends that in a certificate proceeding under Section 7(e), where the price being paid by a producer is above that then being paid by others in the specific area, the commission must either impose a price condition or determine the justness and reasonableness of the price, as in a proceeding under Sections 4 and 5. In other words, it is contended that the commission, in such a situation, has no discretion but must take one of the two courses. We think not. Section 4(a) states the substantive objective of the Act, that rates be reasonable; it does not specify the procedure by which this objective is to be attained. That procedure is prescribed by Sections 4(d), 4(e) and 5(a). The commission cannot be required to convert every certificate proceeding into a rate proceeding." ■

To sell them on GAS sell them

Siegler
PATENTED AUTOMATIC

SIEGLER'S TROUBLE-FREE PERFORMANCE GUARANTEES WARM FLOORS AND SATISFIED GAS CUSTOMERS

Satisfied customers are your best defense against competition. And what customer wouldn't be satisfied with the benefits that only Siegler offers:

"Traveling" Floor Heat. A Siegler puts the heat on the *floor . . . "travels"* the heat to *every* room.

Siegler's Patented Heat Tubes capture all the heat. The Patented Built-in Blower System "travels" it over the floor. That's why Siegler alone can offer this guarantee: *more and hotter heat over the floor—or money back.*

Here's performance and features you can show and dramatically demonstrate. That's why it's easy to sell customers up to Siegler. And profitable too . . . Siegler makes warm friends for gas and *all* gas appliances.

HOW SIEGLER HELPS YOU SELL:

1. Solid Advertising Support. Siegler gives you a generous dealer advertising plan that sells Siegler heaters *and your store!* Nationally, Siegler backs you with the biggest advertising campaign in the business.

2. Special Promotions. Make big profits running tested promotions that fit your business to a "T." Siegler supplies a complete package of material for each promotion, and we help you run it!

3. Selective Distribution. When you merchandise Siegler, you're the dealer who cashes in on national and local advertising. Get all the facts on Siegler Selective Dealership plan.

4. Your profit stays in your pocket . . . no loss for call-backs and complaints. Siegler quality sees to that and makes every customer an enthusiastic salesman for you.

5. A Complete Line. There's a Siegler with "traveling" floor heat that's just right for every home from 2 to 7 rooms. You can solve any home heating problem with Siegler.

6. Your Own Merchandising Man. Your Siegler Representative is a full-time, trained specialist in the home heater field. He will show your salesman how to "sell 'em up" to Siegler, and help you plan your advertising, promotions and demonstrations.

SIEGLER DOES MORE WITH GAS MORE FOR GAS!

WRITE FOR Siegler GAS HEAT PROMOTION PROGRAM

SIEGLER HEATER COMPANY, Dept. G-8
Centralia, Illinois

Siegler Gas Home Heaters

Gentlemen: Please send information on Siegler's plan for building gas heating sales.

Name _____

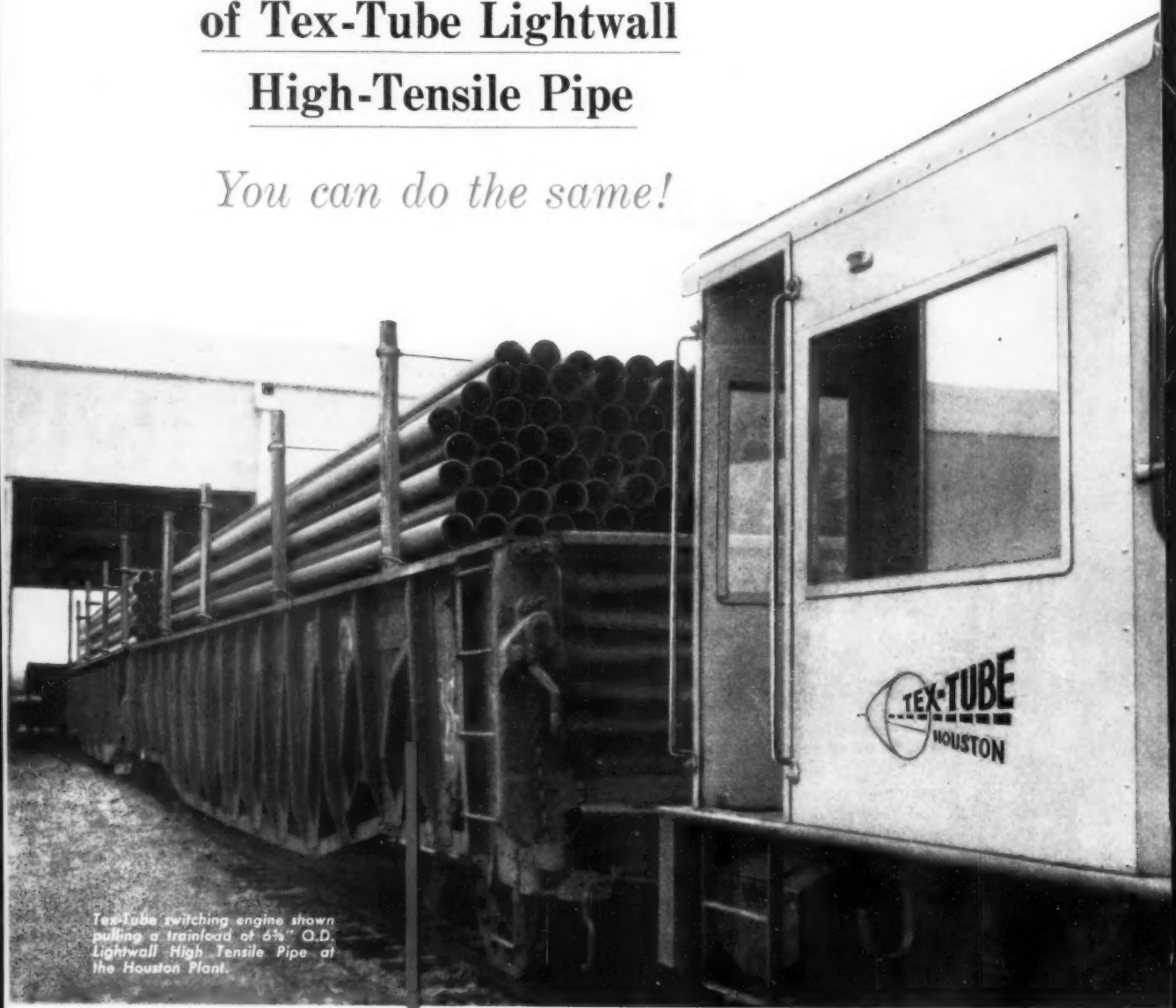
Company Name _____

Address _____

City _____ State _____

Our Customer Saved $2407 per Mile of Pipe on this Trainload of Tex-Tube Lightwall High-Tensile Pipe

You can do the same!



Tex-Tube switching engine shown pulling a trainload of 6⅝" O.D. Lightwall High Tensile Pipe at the Houston Plant.

TEX - TUBE, INC.

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Sales Offices in Midland, Texas - Tulsa, Oklahoma
Baton Rouge, Louisiana

LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

TECHNICAL TRENDS

By GUY CORFIELD

Helium in natural gas

Helium gas is a valuable natural resource. Its original use was as a non-flammable gas for balloons and lighter-than-air aircraft. It is now employed in a variety of industrial processes, and is becoming important in the development of industrial nuclear energy, rocket and missile propulsion.

The only source is natural gas and several plants have been built to extract it, where large volumes of gas contain sufficient concentration. The process is one of liquefaction and distillation, which is expensive. It is estimated that about 10 times as much helium is wasted, as is now recovered, either because the natural gas is low in concentration, or helium-rich gas wells have insufficient reserve volume, to warrant the expense of conventional recovery plants. Helium is an irreplaceable resource, however, and this waste is causing increasing concern.

Information has recently been released from the Bell Laboratories that their researchers believe that the ability of helium to selectively diffuse through glass can be put to practical use. They visualize helium recovery plants, using a relatively simple diffusion process, installed on natural gas pipelines from wells which by present standards are marginal in helium content.

Preventing gas cylinder mixups

Under the auspices of the American and Canadian Standards Associations, the Compressed Gas Association has standardized cylinder valve inlet and outlet connections to guard against accidental use of the wrong gas. Both in medical and industrial fields, the use of the wrong gas could be disastrous—such as carbon dioxide for oxygen, hydrogen for nitrogen, or chlorine for ammonia. The principal approach has been through the cylinder valve outlet connection, in the valve itself, and the fitting that connects to it. Under these standards the apparatus that receives the gas would have a designated and numbered type of terminal (entry) fitting. Only a cylinder with a valve corresponding to this fitting could be connected.

The threads on the valve outlets are separated into four basic divisions—internal and external, and right hand and left hand. Within each division, further separation is made by varying the pitch and diameter of the threads, and diameters are so spaced that adjoining sizes either will not enter or will not engage. Some concessions were made to previously established practice, and to avoid costly changeover. In general, however, a plan has been followed whereby right hand threads are assigned to non-fuel gases and water-pumped gases, and left hand threads to fuel gases and oil pumped gases.

These standards are designated American Standard B57.1-1957 and Canadian Standard B96-1957. They are detailed in a booklet "Compressed Gas Cylinder Valve Outlet and Inlet Connections" which can be obtained from American Standards Association Inc., 70 East 45th St., New York 17, N. Y. The cost is $1.50.

Heavy Water

In the new terminology of nuclear energy we often read about heavy water. This is actually water which contains heavy hydrogen or deuterium, and so the chemcal name for heavy water is deuterium oxide, D_2O. Deuterium is double the weight of normal hydrogen and so deuterium oxide or 100 per cent heavy water is approximately 10 per cent heavier than normal or regular water, H_2O. Chemically speaking, deuterium is an isotope of hydrogen —it has the same chemical characteristics but is different in atomic structure.

The existence of deuterium and heavy water, and of tritium, which is three times the weight of normal hydrogen, has been known for many years but has recently come into technical prominence in connection with nuclear energy. Heavy water is being used extensively as a combination heat exchange medium and moderator in nuclear fission reactors. As a moderator it is greatly superior to ordinary water; the moderating function is to control the rate of reaction so that it will be sufficiently rapid to produce usable heat but not so fast as to result in explosion. More recently, in research toward harnessing the heat release of the hydrogen bomb or hydrogen fusion to peacetime uses, deuterium and tritium have been found to be promising starting points. Fusion (thermonuclear) heat is developed through the union of hydrogen atoms to form helium plus neutrons (electically neutral particles) plus energy. Recent experiments indicate that this reaction can be produced in a controlled manner — though only for periods of micro-seconds —by the heating of a mixture of deuterium and tritium to several million degrees C, by means of a heavy electric current.

Heavy water is normally present in ordinary water, either fresh or salt, in a concentration of 0.014 to 0.015 per cent. If it is the key to controlled nuclear power it is therefore available in virtually limitless amounts. Several processes have been developed for its separation and purification. The Atomic Energy Commission has recently revealed details of a three-phase operation: a dual-temperature exchange, using hydrogen sulfide as an absorber-exchanger, to concentrate to about 15 to 20 per cent; distillation to bring up to 90 per cent, as D_2O boils at a slightly higher temperature than H_2O; and electrolysis to purify to 99.8 per cent. AEC will now sell D_2O at $28 per pound. Sales, generally for nuclear reactor use, are now of the order of 500 to 750 tons per year.

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Here is real "package" pipe buying—convenient and time-saving—from one dependable source. One call gets you the pipe you need—faster—and from specialists who know the pipe and pipe fabrication business. Try us for the unusual large-quantity orders, the hard-to-get sizes, and for especially good buys in structural pipe ⅛" thru 48".

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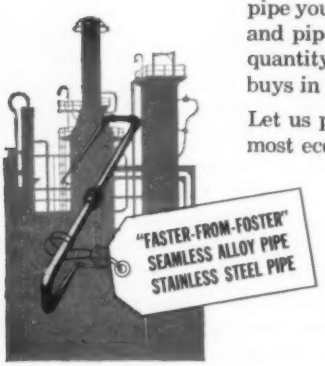

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WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

New face for Congress in 1959?

FEDERAL lawmakers are getting ready to return home after another session of wrangling over the problems of the world, the country, the folks back home, and the moral undertone of vicuna coats, Persian rugs, and labor finances.

They'll soon be stumping the countryside to drum up votes for themselves or their favorite candidates in the fall elections. (One-third of the Senators and all members of the House of Representatives are up for re-election this year.)

This is going to be a good time for anyone interested in what goes on in Congress to put some inquiries to these politicians. While the promises and opinions expressed during political campaigns don't necessarily represent the real position of the politician making them, they're often a good indication.

Here are a few of the issues which gasmen should put to their congressional candidates.

Natural gas legislation; gas and oil depletion allowances; the Memphis decision; general philosophy of government regulation of business; importation of gas; government regulation of advertising expenses by natural gas companies, taxes generally, and all the local problems they can think of.

All told, the gas industry had a negative year in Washington in 1958. Failure of the gas bill, the Texas dinner blooper, the Memphis decision and the spreading control of the Federal Power Commission highlighted the year.

There's little to indicate now that things will be any better next year, and they may be worse. The complexion of Congress next year will change toward the so-called "liberal" side, which generally means the pressure will be for increasing government control and further government intervention in the business and economic affairs of the country.

One story, circulating among Democrats in the congressional cloakrooms, could be particularly hard on the independent gas producers, if true. According to this talk, old-timer Sam Rayburn, powerful Texas Democrat who has run the House under a benevolent dictatorship for years, may retire. His retirement would depend on Rep. Noble Gregory's winning a court ruling giving him the Democratic nomination in a disputed primary election in his district in Kentucky.

If Rep. Gregory does win, Rayburn would retire, put Rep. Wilbur Mills (D.-Ark.) in as Speaker of the House, and see that Rep. Noble gets Mills' present post as chairman of the important Ways and Means Committee.

Rep. Rayburn has been a strong supporter of the gas industry. Rep. Mills has followed his mentor's lead when running the Ways and Means Committee, but is considered more liberal than the crusty Texan, and might if given power, shift at least a little. Rep. Gregory is considered the least conservative of the three, although he still fits within the pattern of the Southern conservative.

All in all, such a shift would not help the gas industry, and might cause some trouble.

Many of the so-called free enterprise congressmen will disappear from the congressional scene after this year. As a result, the faltering conservative bloc in Congress will become even weaker, and the rising liberal tide will grow in number and take over more important positions on key committees.

Among those leaving, are Senate Minority Leader William Knowland of California, who has plumped for strong curbs on labor unions; Sen. Edward Martin of Pennsylvania, an arch conservative in fiscal affairs and a power on the Senate Finance Committee, and Indiana's Sen. William Jenner, an outspoken critic of the Supreme Court for making laws, rather than interpreting the laws made by Congress. All these men are Republicans.

A dozen strongly conservative members of the House are also bowing out this year, and are for the most part expected to be replaced by liberals.

As Congress shifts to a more liberal complexion, the trend of government is expected to be toward more government spending for social programs, with higher tax needs, bigger deficits, and more inflation. It'll also mean support for high-priced federal power projects and expansion of the Tennessee Valley Authority and other New and Fair Deal programs.

Typical of the type of legislation these interests might be expected to push are bills now pending to outlaw so-called "propaganda advertising, lobbying and other political activities" of utilities from being considered normal operating expenses.

The bills now pending are aimed at the electric utilities, but would be applied eventually to all similar utilities, including gas firms, opponents insist.

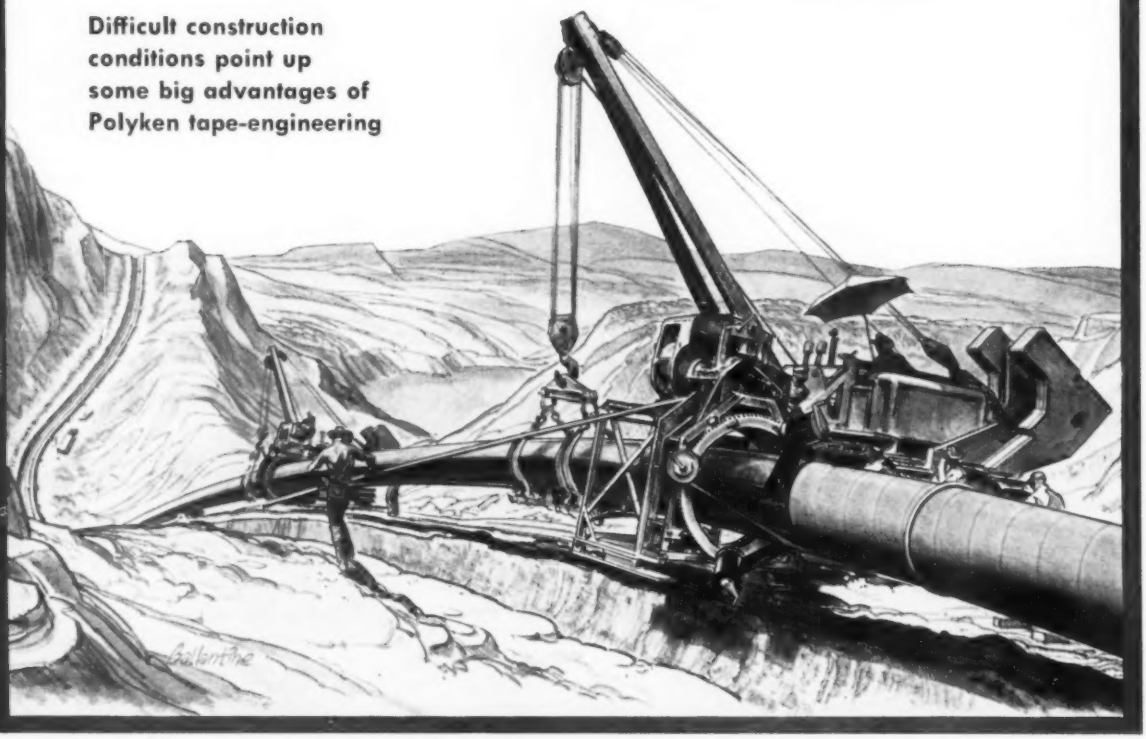
Effect of this ruling would be to hang a strait jacket on normal business practices of the utilities, while leaving such outfits as the TVA free to spend taxpayer money to do in essence the same thing. Public service advertising and lob-

Continued on page 148

Why do Canadian spreads coat with Polyken tape?

(the proven polyethylene tape)

Difficult construction conditions point up some big advantages of Polyken tape-engineering



Canadian pipeliners have learned their business the hard way. That's why many have turned to Polyken tape and Polyken know-how—for proven results like these:

1. Substantial labor and equipment savings due to simplified operation.

2. Faster construction—consistent high daily output.

3. No hot dope preparation—tape is always ready.

4. No drying or cooling time. Simple clean-wrap-and-lower operation makes for a tight spread and closer supervision.

5. Vastly reduced warehousing, shipping, handling costs.

6. Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.

7. Wrap goes into ground in factory-uniform condition.

Today, considering the construction economies regularly reported, you just can't afford to overlook the Polyken method.

Polyken®

Experienced in modern PROTECTIVE COATING

THE KENDALL COMPANY
Polyken Sales Division

If you would like to know more about proven *Polyken protection, contact Polyken Sales Division, Dept. G8, 309 W. Jackson Blvd., Chicago 6, Ill.*

By MARSHALL E. PARKER

Anode beds for impressed current

IN designing an impressed current cathodic protection system, one of the tasks is ground bed design. The selection of a rectifier to power the ground bed must be done at the same time, and is, in fact, a part of the design problem. Two determining factors are always present; the desired value of current to be drained, and the resistivity of the soil at the site. The calculations may be considerably simplified by a certain amount of preliminary standardization.

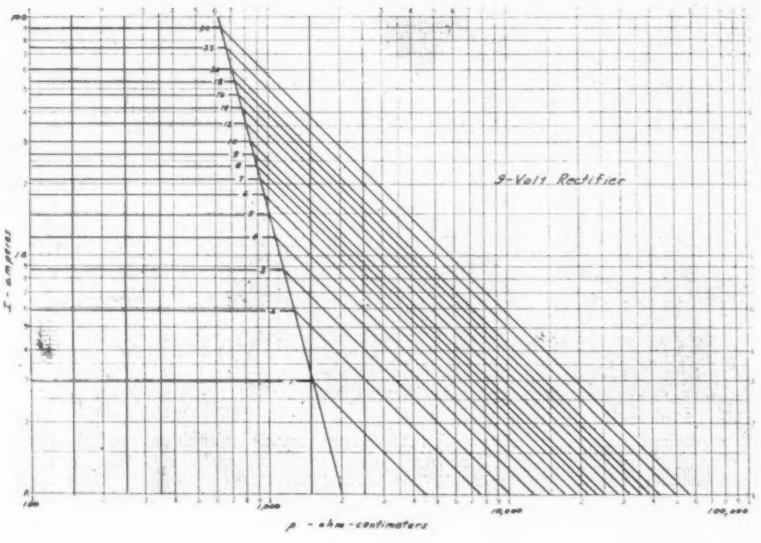
One organization, for example, has standardized on a particular manufacturer's line of rectifiers, which are available in a fixed set of output voltages. They have further standardized on the use of a 15-in. augered hole for vertical coke breeze anodes, and these are normally set at the standard spacing of 15 ft. The central contact to the coke breeze is made either by a 3-in. x 60-in. graphite rod or by a 2-in. x 60-in. high-silicon iron rod. In the case of the graphite, the maximum current drain per rod is (by manufacturer's recommendation) 3 amp. For the high-silicon iron, the limitation is higher, but keeping the current below 3 amp assures adequate life for the coke breeze, so the same limit is observed except in special cases.

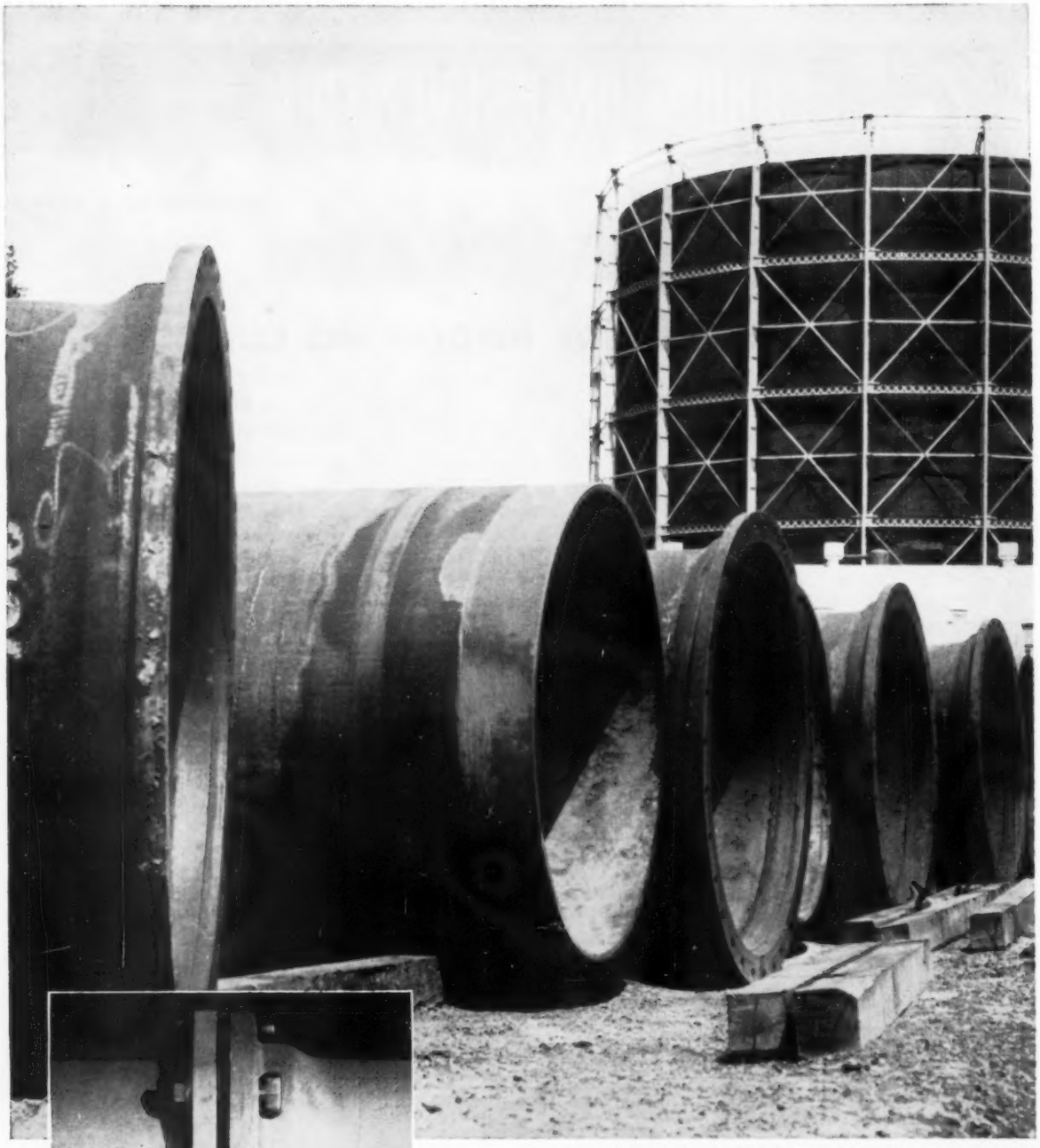
Adopting these standards permits the calculations to be reduced to a set of charts, one for each rectifier voltage. A chart for a 9-v rectifier is shown. Similar charts for 12-, 16-, 20-, 28-, 40-, and 56-v rectifiers are available. The manner of use is as follows:

Selecting a rectifier voltage at random, the intersection point is located corresponding to the desired current (vertical scale) and the known soil resistivity (horizontal scale). If this point lies to the right of the single solid sloping line, the full voltage of the rectifier will be required, and the rods will be discharging less than 3 amp each; a high voltage unit is indicated. If the point lies to the left of the dotted sloping line, the current density will be 3 amp per rod, but the full voltage of the unit will not be used; a lower voltage unit is indicated.

When the point lies between the two sloping lines, the unit choice is optimum; both rectifier and rods are being used at near capacity.

One factor is not taken into consideration by these charts, but must be worked out separately. The total installed cost of two or three combinations — as indicated by the charts—should be figured. Then the total annual operating costs should also be figured, and the ultimate choice made on that basis. Sometimes, when power costs are high, the use of a lower voltage unit, with a large number of rods, is indicated, in order to minimize power costs. Care should be taken, where the unit is an isolated one, with its own electric service, not to carry power savings to a point below the minimum monthly charge; the result will be a saving in kilowatt-hours, but not in dollars! ■





Large diameter Mechanical Joint cast iron pipe to be installed for feeder mains in gas distribution system at Indianapolis, Ind.

CAST IRON®

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

MECHANICAL JOINT cast iron

its main job is to serve a century

Cast Iron Pipe's dependability is built in

Buying pipe is a major investment . . . one you naturally want to protect. And you do when you specify cast iron. No other pipe comes even close to matching its performance. Consider: 57 American gas companies are still using cast iron gas mains laid a century and more ago. Hundreds more have passed the fifty year mark of service. That record alone would justify your choice of cast iron. But *modern* cast iron pipe, centrifugally cast, is even tougher, stronger, more serviceable. Cast iron's dependability, long life and long term economy are built in.

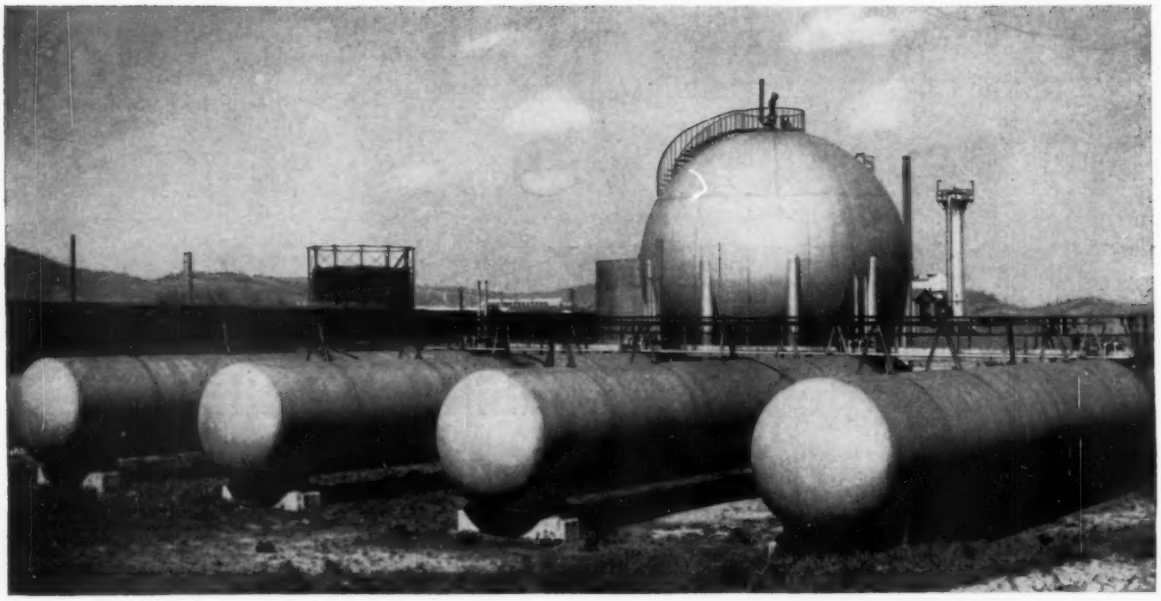
A FEW OF THE 57 GAS UTILITIES WITH CENTURY-OLD CAST IRON MAINS IN SERVICE

Peoples Gas Light and Coke Co., Chicago — Consolidated Gas Electric Light and Coke Co., Baltimore—Philadelphia Gas Works—Richmond Gas Works, Richmond, Va. — Hartford Gas Company, Hartford, Conn.

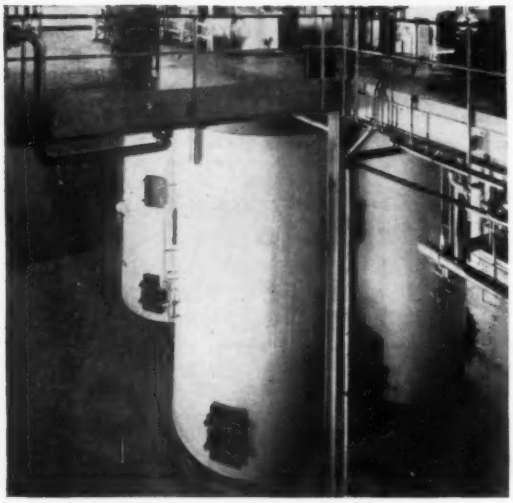
MODERN CAST IRON PIPE IS EVEN MORE EFFICIENT

- Centrifugally cast, it's tougher, stronger, more uniform.
- Standardized mechanical joints are bottle-tight under all gas pressures . . . for all types of gas.
- Uniform wall thicknesses.
- Joint design allows deflection during and after installation.
- Service lengths and variety of standard fittings cut time and labor in congested undergrounds.

pipe FOR MODERN GAS DISTRIBUTION



Gas production facilities by United Engineers—to handle current and projected peak loads economically



If your planning shows a demand curve rising above your production capacity in the near future, the time to call in experienced counsel is right now. The long experience of United Engineers in designing and installing gas production equipment of many types and capacities can be of practical service to you.

After careful study of your equipment and your estimated gas production requirements, we may recommend modification of existing gas equipment or installation of new units. A reliable L.P. gas plant may well be the answer to your needs . . . a high Btu oil gas apparatus . . . or you may want the flexibility, high capacity, and economical operation of a U.G.I. Cyclic Catalytic Reforming (CCR) Unit.

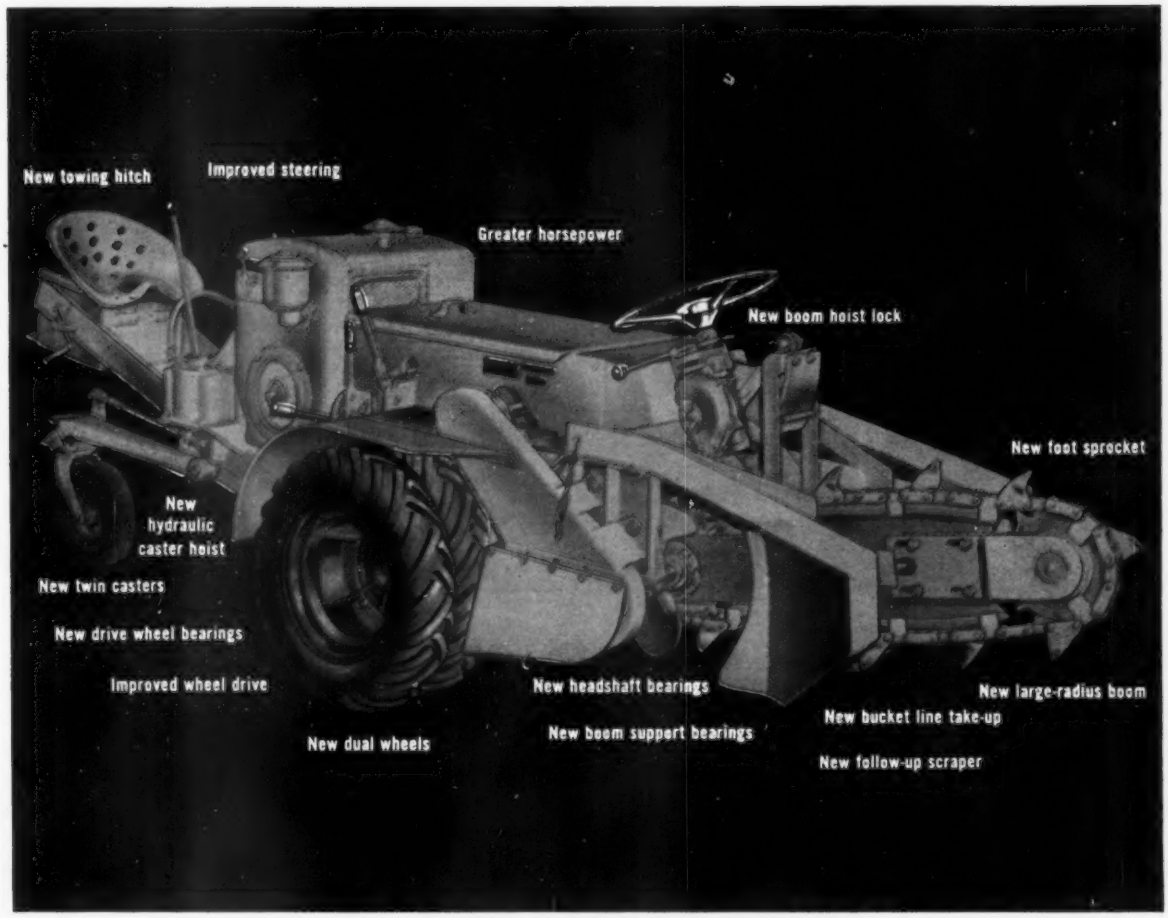
The experience of 70 years' service in the gas industry is at your disposal in developing facilities to meet demand. And our many new assignments from clients previously served is your assurance of maximum return for each dollar expended.

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

New York • PHILADELPHIA • Chicago



No other ditcher equals the new 702-A for electrical, plumbing and excavating contractors, railroads, utilities, telephone companies, and government bodies. Write for literature.

Easier operation, reduced maintenance, greater maneuverability with

New Barber-Greene 702-A Ditcher

New cost and performance records for underground placement of gas, water, electric and telephone services, sprinkler systems, and all other work requiring narrow trenches were set by the Barber-Greene Model 702 Ditcher. The new Model 702-A offers even faster, more economical digging.

Maintenance costs are reduced by new headshaft bearings, new boom support bearings, new large-radius foot end, and optional foot sprocket. New positive boom hoist lock.

Greater horsepower and new reduced bucket line speed allow digging through tougher materials. New hydraulic caster hoist makes height adjustment easier, more accurate. Optional dual wheels allow machine to operate on unstable bases. Optional electric starter.

The 300% more brake area and improved lever action make steering easier, more accurate. Optional follow-up scraper assures clean trench. New bucket line take-up is readily accessible.

Faster towing with new tapered roller wheel bearings and improved towing hitch. Optional twin casters give better stability and steering, and allow machine to straddle trench.

58-43-D

Write for information on the newest ditcher in the line of advanced design.

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

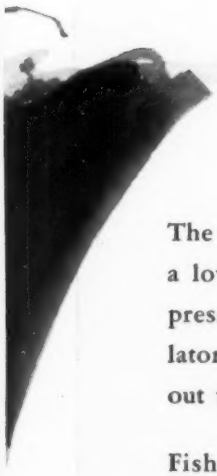
CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

Sweet dreams for the gas man

...ENGINEERED BY FISHER

FISHER

safety relief valves
free him of needless worry



The relief valve method of protecting a low pressure system from excessive pressures in the case of a district regulator failure is widely accepted throughout the industry.

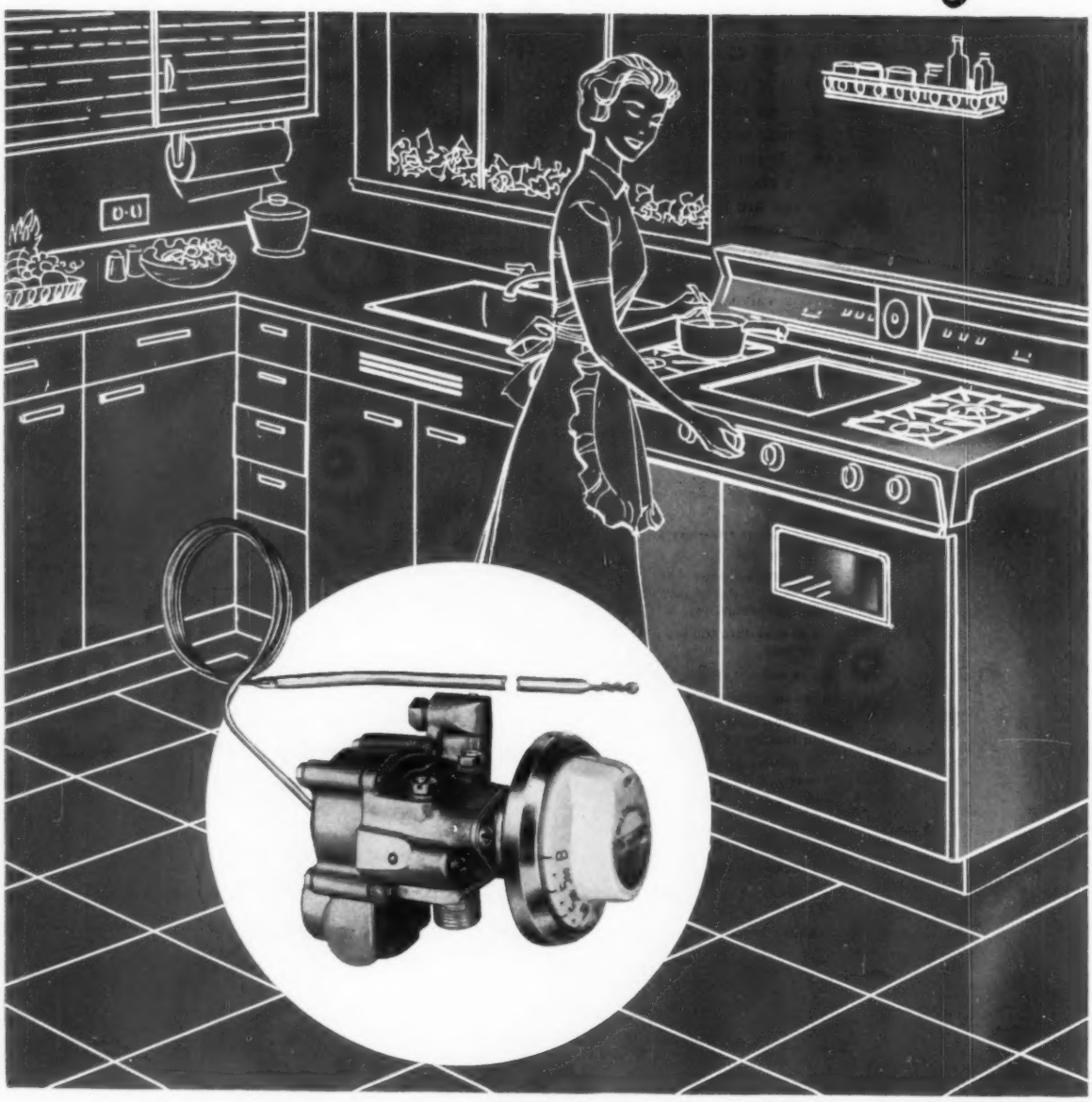
Fisher offers a complete selection of safety relief valves to prevent excessive pressure in low pressure gas distribution systems. Fisher gives you capacity, extreme sensitivity, dependability under all operating conditions.

If you want to learn more about the Fisher line of Safety Relief Valves, write for complete information.

FISHER® Controls
SINCE 1880

FISHER GOVERNOR COMPANY
Marshalltown, Iowa / Woodstock, Ontario / London, England
CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

New WILCOLATOR MODEL X *simplifies stove design,*



New Wilcolator Model X gas oven control incorporates simple, durable construction features developed in the production of over 35 million thermostatic controls. Extremely accurate liquid expansion thermal system—used throughout the industry today—was first introduced by Wilcolator.

GAS OVEN CONTROL

saves assembly time

SMALLER, MORE COMPACT, HIGHER CAPACITY

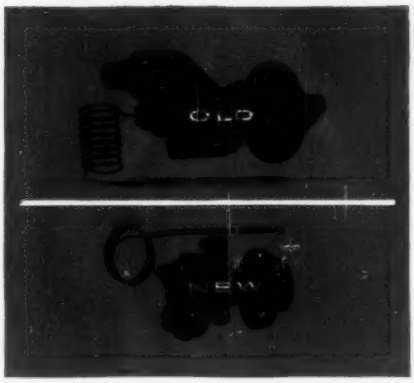
The new Wilcolator Model X Gas Valve and Oven Thermostat is much smaller than previous models. It helps you design more compact manifold assemblies, such as those required on sloping front valve panels. Model X also simplifies design of outlet connections, because it offers a choice of four different outlet casting positions. No special fittings are needed. Dial and bezel snap in place. These features save assembly time, help reduce labor costs.

Wilcolator Model X is a high-capacity control built for years of safe, dependable operation. Its stainless steel diaphragm and special aluminum alloy gas valve are of proved design based on engineering experience accumulated in the manufacture of over 35 million thermostatic controls.

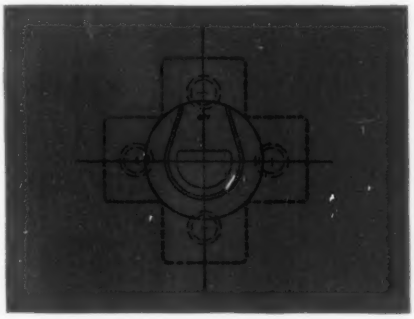
Temperature range of the new X control is 200-550°F., plus broil. Write for new catalog and price information.

NEW ADVANTAGES

1. Smaller than any previous thermostat. More controls per unit of space for inventory.
2. Higher capacity—AGA-approved rating, Btu/hr: manufactured gas—49,000; natural gas—72,500; LP gas—154,400. Means less pressure drop and faster preheating.
3. Same centerlines as standard top burner valve. Eliminates flattening the manifold.
4. Thermostat body is self-locating on flange fitting.
5. Newly designed, positive calibration lock.
6. Completely automatic calibration eliminates all chances of human error in factory calibration.
7. Flange fitting and gasket preassembled; eliminates handling one extra part.
8. Improved, simplified ambient temperature compensation.
9. Simple, trouble-free thermostat mechanism virtually eliminates backlash.
10. Flange bolts and lockwashers preassembled to save installation time.
11. Bypass and pilot adjustments can be made on a cold oven.
12. Improved field calibration adjustment eliminates locking screws.



Smaller. New Wilcolator Model X oven control is only 3/5 the size of previous C-5 model, helps you design more compact manifold assemblies. Unit can be installed on sloping front valve panels without interference with the burner box.



Outlet casting—adapted to standard Loxit nuts—can be located in any one of the four positions shown. This flexibility simplifies your design problems, eliminates need for special fittings.

Dials are available in white with black markings, black with white markings, and gray with white markings. Inserts are stocked in various colors and markings. Custom dials and inserts also available. Bezel finished in polished chrome.

Thermostats for Every Heating and Cooling Application

THE Wilcolator COMPANY

THE WILCOLATOR COMPANY
1001 NEWARK AVE., ELIZABETH, N.J.
In Canada: Wilcolator (Canada) Ltd., 221 Evans Ave., Toronto 14, Ont.
Export: Wilcolator, 1010 Shaff Bldg., 1505 Race St. Philadelphia 2, Pa.

UTILITIES REPORT:

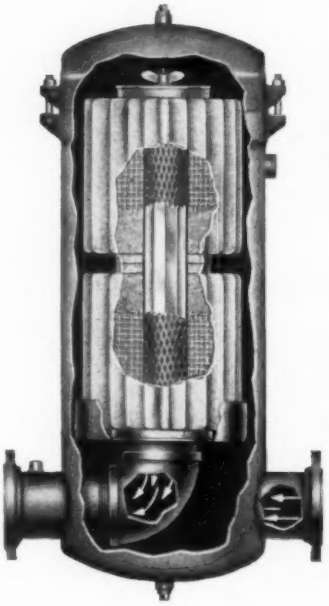
"No more clogged pilots and house regulators . . . fewer service calls."

STAYNEW GAS FILTERS

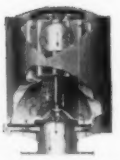
REMOVE DUST FROM NATURAL GAS PIPE LINES

Conversion to natural gas always means dust problems, *unless* proper filtration is provided in the district regulator valve chambers. Staynew Filters (model CPHG with the WRC-20 medium) provide exactly the desired filtration to completely eliminate your dust problems and thus reduce service calls and customer complaints.

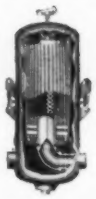
For natural gas filtration, Staynew Filters are available in the widest range of sizes . . . pressures to 10,000 psi. . . . capacities to handle 100,000,000 cu. ft. or more per day.



STAYNEW MODEL CPHG GAS FILTER with the new WRC-20 Medium which removes particles 2 microns or less in diameter.



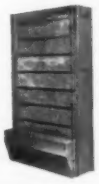
INTAKE FILTERS



LIQUID FILTERS

PIPE LINE FILTERS

ELECTRO-STAYNEW PRECIPITATOR



AUTOMATIC AIR FILTERS

PANEL FILTERS

SPECIAL FILTERS

Write for Gas Filter Bulletin 290R and technical article on Gas Filtration. Dollinger Corporation, Dept. 68, Centre Park, Rochester 3, N. Y.

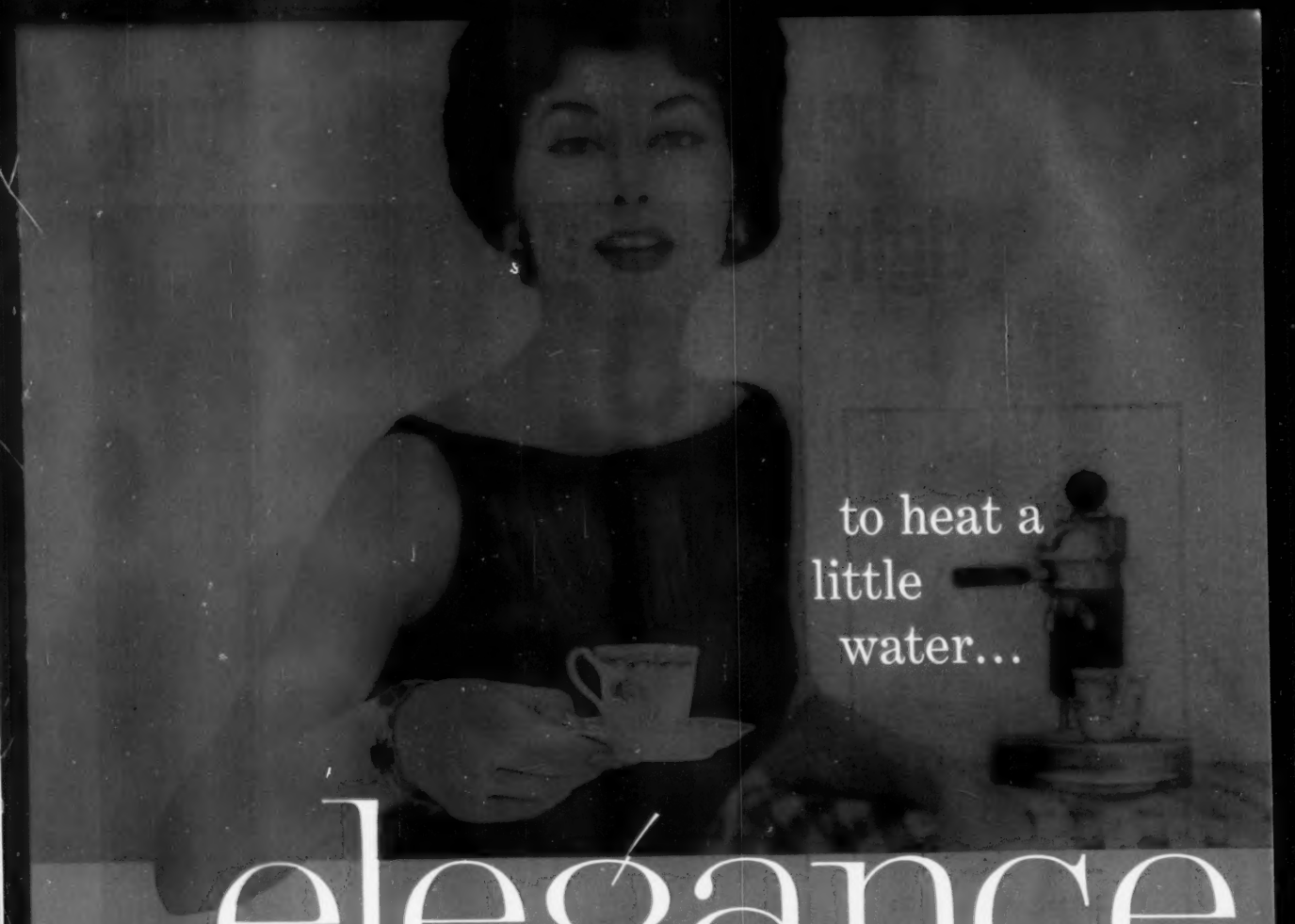
PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

SPECIALIZING IN DRY TYPE FILTERS FOR OVER 35 YEARS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS



to heat a
little
water...

elegance

to heat a
lot of water...

the newly redesigned

ROBERTSHAW Unitrol 400
WATER HEATER CONTROL

the dependable way to
step up the appearance of your water
heaters for increased sales

SMARTEST!
UNITROL 400

SMARTER...
UNITROL 200

SMART...
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advertised in
GOOD HOUSEKEEPING
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AMERICAN HOME
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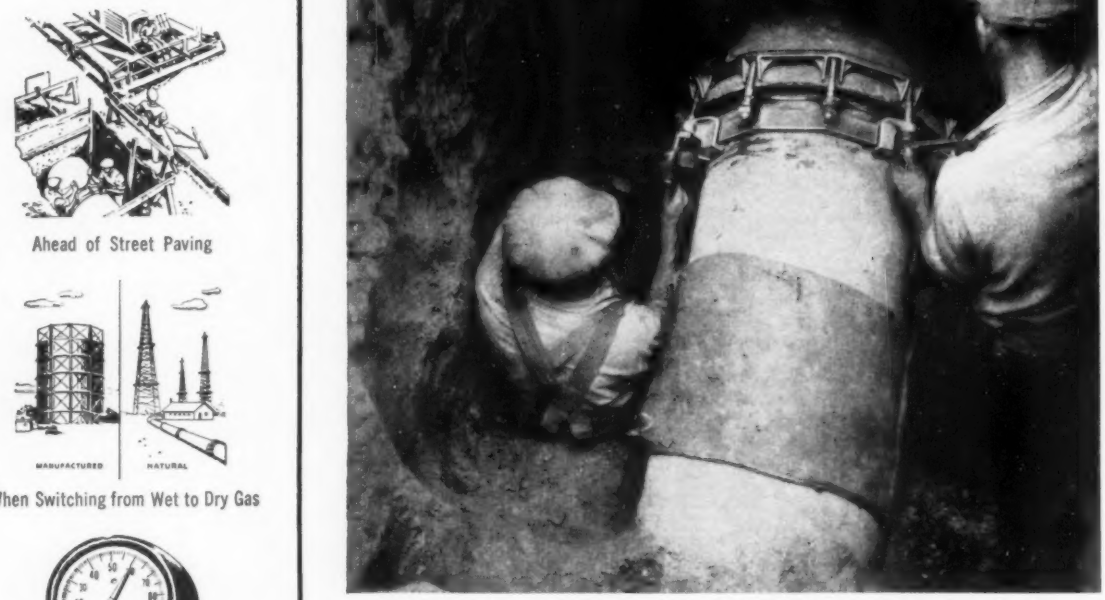
Guaranteed by Good Housekeeping

Robertshaw-Fulton
CONTROLS COMPANY
GRAYSON CONTROLS DIVISION • LONG BEACH, CALIFORNIA

They're making this joint tight for life!

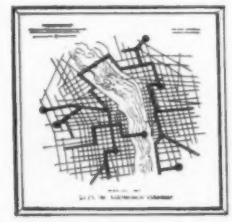


Last step in the installation of a Dresser Style 60 clamp . . . drawing up the bolts. Special-compound rubber gasket maintains gastight seal against caulking compound . . . lasts the life of your pipe. Write for illustrated brochure on the Style 60.

Ahead of Street Paving

When Switching from Wet to Dry Gas

When Boosting Pressure



In Progressive Maintenance Programs

Make clamping with the time-tested Dresser Style 60 standard practice

Rehabilitating and upgrading old cast-iron mains? Be *sure* of permanent joint tightness by using the time-proved clamping method and performance-proved Dresser "Adjustable" Style 60 Bell-Joint Clamps. You eliminate guesswork, and possible hazards.

Proved since 1901, when Dresser provided the first Bell-Joint Clamp, this mechanical, *positive* method for making bell-and-spigot joints gas tight has been approved by gas company operating departments everywhere. Thousands of miles of mains are giving renewed service at higher pressures, safely, after joint reinforcement with Style 60 Clamps.

Preventive maintenance is truly "preventive" when you clamp. Make doubly sure by making the Dresser® Style 60 *standard practice.*

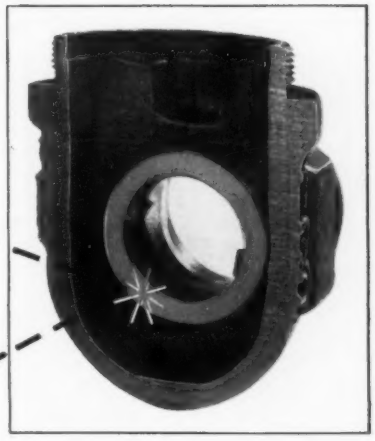
DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

Bradford, Pennsylvania
Chicago
Houston
New York
Philadelphia
San Francisco
Toronto

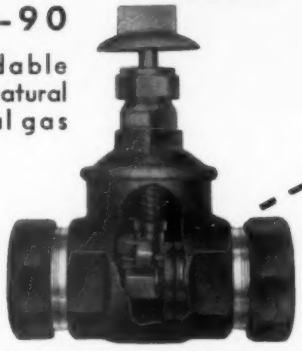
THESE PRECISION-GROUND SURFACES ASSURE

A PERFECT SEAL WITHOUT LUBRICATION!



LIST G-90

For dependable control of natural or artificial gas lines.



Iron body valve, bronze mounted, with mirror-finished gate and seat. Dresser couplings for use with steel pipe permit quick, simple installation without special tools and are unaffected by temperature changes, ground vibrations or tremors. *Above: 2-inch valve, showing Dresser coupling assembly and internal wedge and gate mechanism.*

Held tightly by the patented closing wedge, the mirror-finished gate and seat surfaces of the List G-90 valve are precision-ground to provide the perfect, cohesive seal. Absolutely *no lubricant necessary . . . ever!*

Write today for full information on List G-90 valves — specified by leading gas companies for over 50 years.

LUDLOW & RENSSELAER

VALVES AND HYDRANTS

THE LUDLOW VALVE MANUFACTURING CO., INC., TROY, N. Y. SINCE 1861

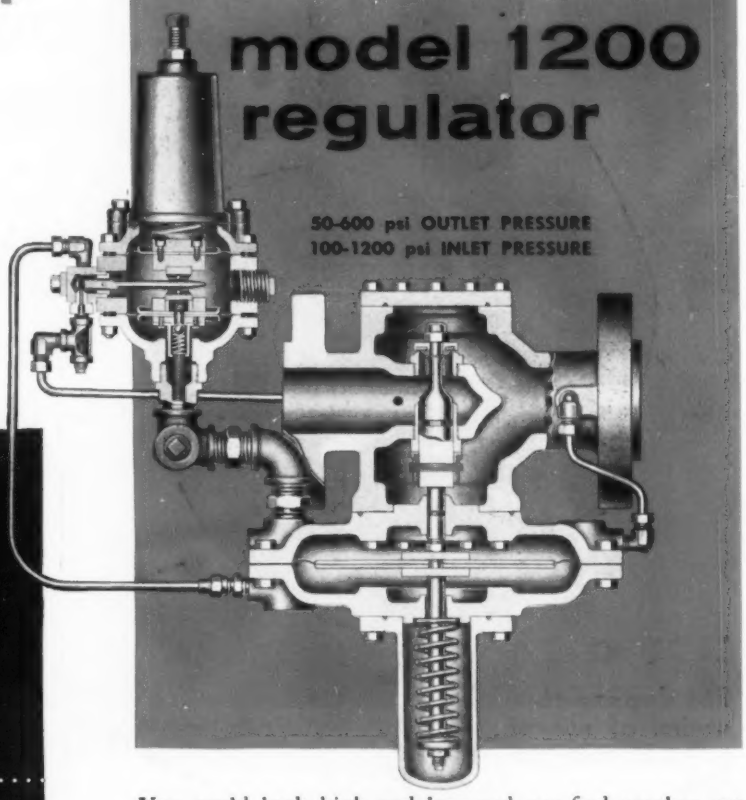
'1200'

A good number to remember

gives widest range control... no other like it!

CHAPLIN FULTON

model 1200 regulator



- Ready for installation . . . no field connections needed
- All-steel construction . . . stainless steel trim
- Pilot loaded for accurate control
- Large capacities 529,000 cfh at 800 psi inlet

SPECIFICATIONS

Single seat valve with molded in place disc—balanced against inlet pressure thrust.

Size—2" flanged Series 60 (Series 30 Optional)

Working Pressure—1200 psi (Series 30-600 psi)

Outlet Pressure

With Type 51 Pilot	50-150 psi
Type 52 Pilot	50-300 psi
Type 53 Pilot	50-600 psi

Face-to-Face

Series 60	10½"
Series 30	9¾"

for complete information write for bulletin 1200

You could look high and low and not find another gas regulator like this Model 1200 in the business. It's compact and self-contained, designed for rugged high-pressure service with Chaplin-Fulton accuracy. No field connections needed—a 2" integral unit ready for installation. Actually, this Model 1200 is an all-steel version of our widely accepted Model 1100 . . . now ready to help solve your high-pressure problems.

ACCURATE CF MFG CO DEPENDABLE

WSW 6834

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania

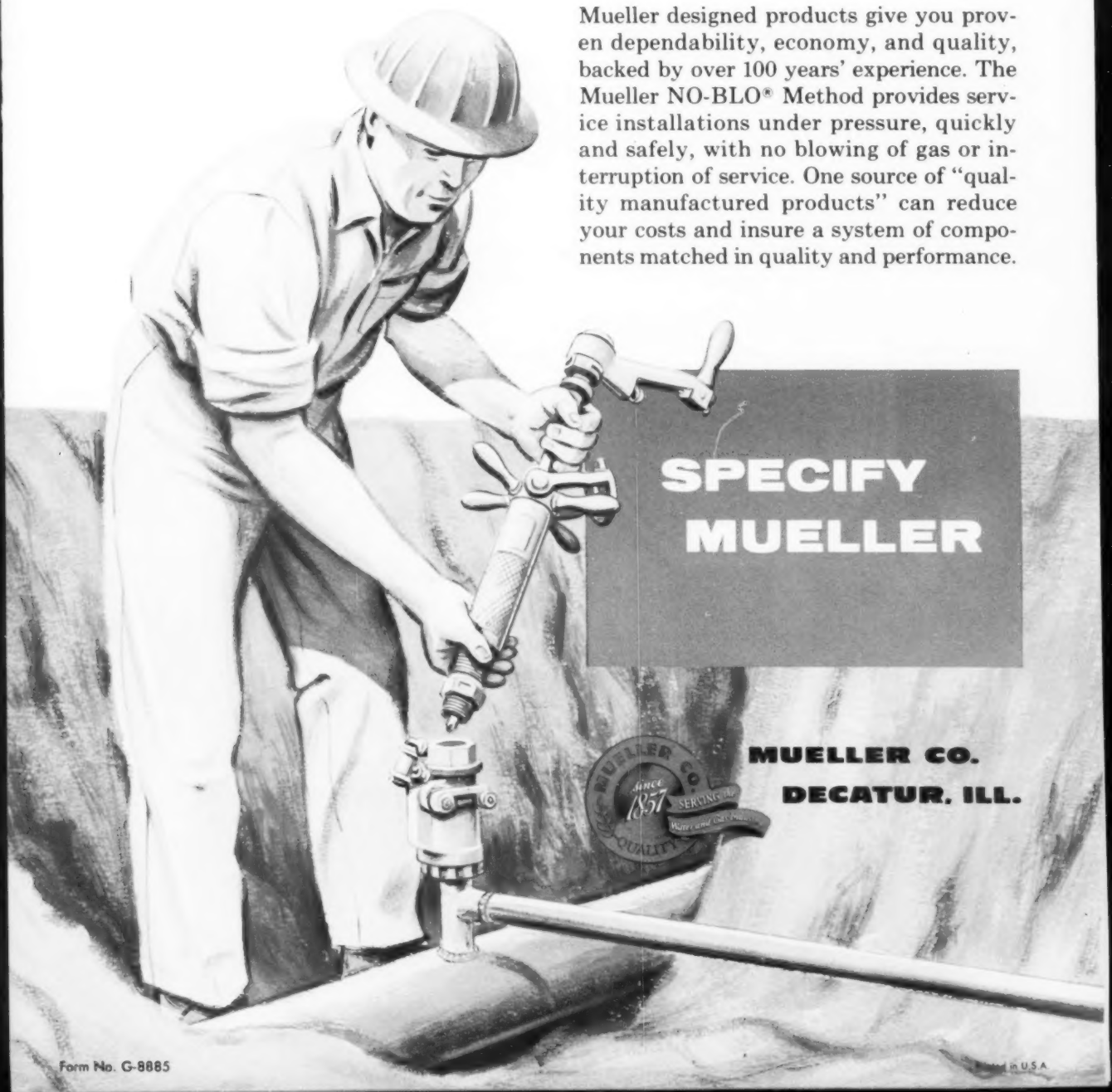
standardize on

MUELLER

the complete line of gas service equipment

matched in quality and performance

Mueller designed products give you proven dependability, economy, and quality, backed by over 100 years' experience. The Mueller NO-BLO® Method provides service installations under pressure, quickly and safely, with no blowing of gas or interruption of service. One source of "quality manufactured products" can reduce your costs and insure a system of components matched in quality and performance.



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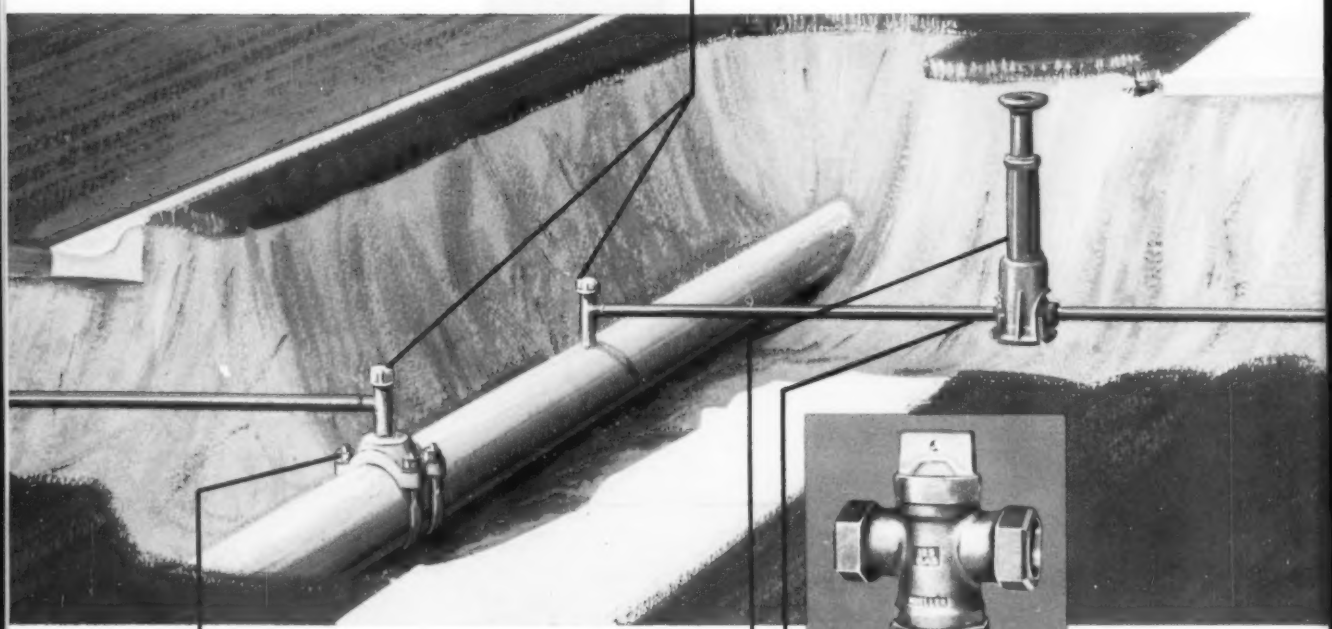
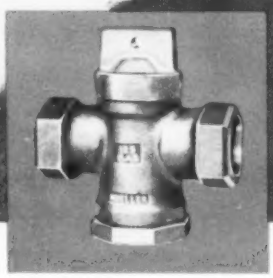
ENGINEERED . . .

service fittings

TEES

Service Tees . . . Valve Tees . . . Curb Valve Tees . . . No-Blo design permits fast, safe service connections—under pressure—with no blowing of gas . . . threaded or welded inlet and outlet types available in a variety of sizes.





SERVICE CLAMPS

for quick, safe connections to any type main under pressure . . . single or double strap type for 1″ to 12″ nominal size mains . . . variety of tap sizes . . . neoprene gaskets cemented in place for installation ease, positive seal and long life.

CURB STOPS

ground key construction . . . precision machined and lapped to insure gas-tight closure . . . inverted key stops available in a variety of end connections . . . forged-steel No-Blo valves available for high pressure service—threaded or welded service connections.

CURB BOXES

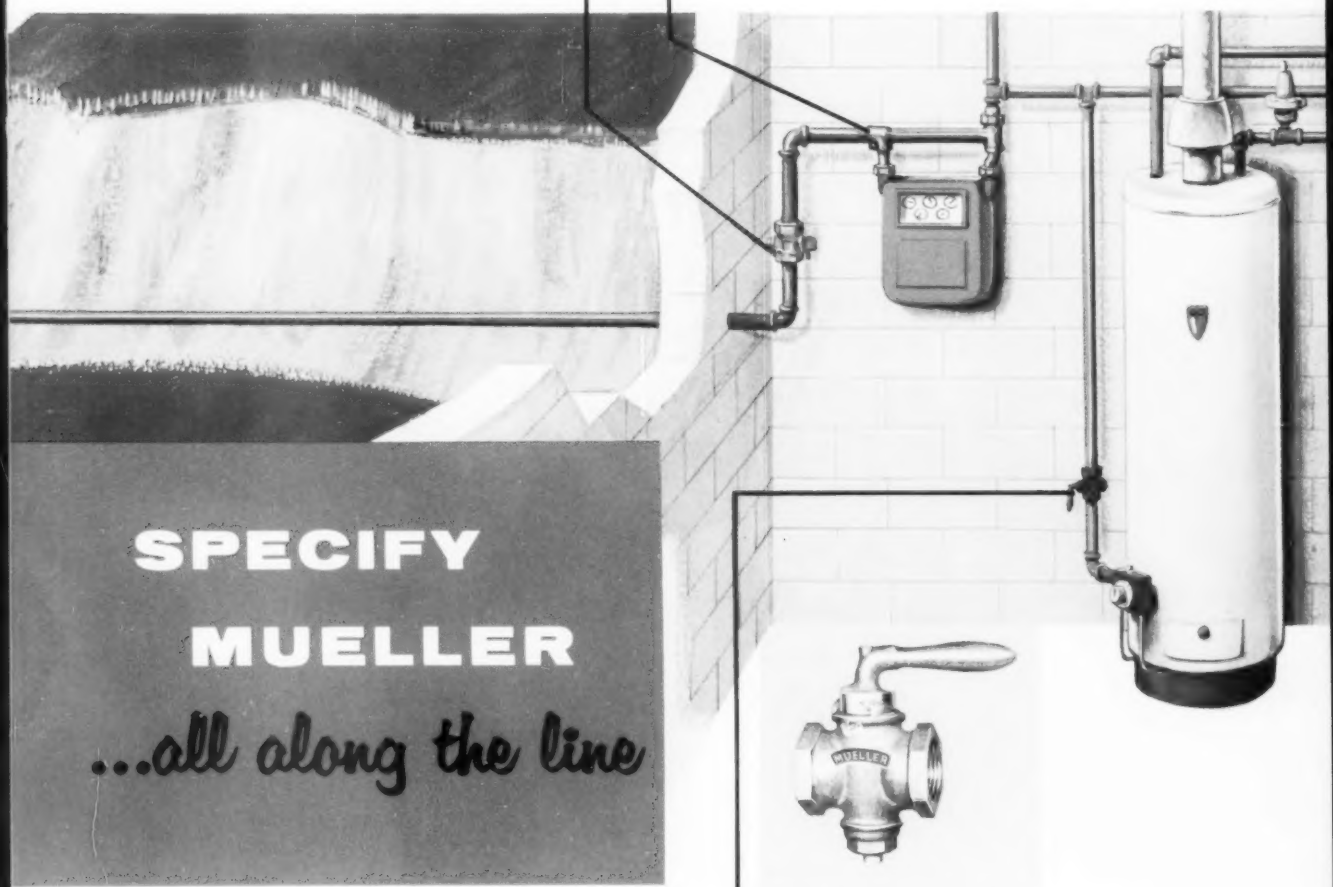
telescopic type to prevent damage to stop or piping . . . large steel upper section will not revolve in base . . . iron to bronze threads prevent seizure, assure easy plug or lid removal . . . with or without stationary rod . . . coated inside and out with tar base enamel to increase resistance to corrosion . . . separate footpiece supports stop and interlocks with curb box—prevents stop from twisting or turning when opening or closing stop.

METER STOPS

ground key construction . . . precision lapped and fitted for gas-tight closure . . . LubOseal® model with "O" ring seals and lubricated key offers absolute protection against frozen keys . . . variety of sizes and end connections . . . forged-steel stops available for high pressure service—welded or threaded connections.

METER BARS

solid iron construction . . . accurately machined to permanently locate and align meter swivels . . . union outlets with neoprene gaskets or bevel connectors, which eliminate unions, are available . . . wide variety of swivels, nuts, reducers, and washers to complete the meter installation.



SPECIFY MUELLER

...all along the line

GAS STOPS

low, medium, and high pressure classifications . . . solid brass . . . ground key construction . . . sizes and types to meet every application in industrial or residential piping.

MUELLER CO.

DECATUR, ILL.

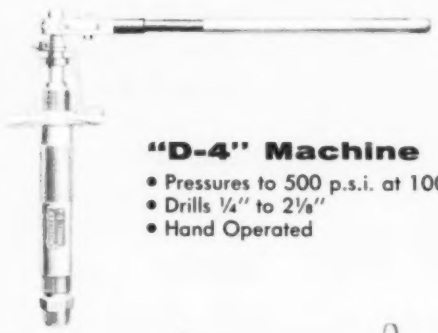
MUELLER NO-BLO® Method machines

let you

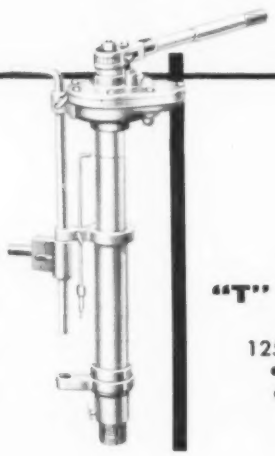
- *drill the main*
- *insert and extract plugs or stems*
- *recondition seats*
- *make stop-offs*

all under pressure, with no blowing of gas or interruption of service . . . economically with complete safety.

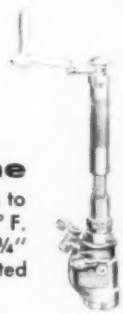
"E-4" Machine
- Pressures to 500 p.s.i. at 100° F.
- Drills ¼" to 1"
- Hand Operated



"D-4" Machine
- Pressures to 500 p.s.i. at 100° F.
- Drills ¼" to 2⅛"
- Hand Operated



"DH-2" Machine
- Pressures to 1200 p.s.i. at 100° F.
- Drills ¼" to 2⅛"
- Power or Hand Operated



"T" Machine
- Pressures to 125 p.s.i. at 100° F.
- Drills ⅛" to ¾"
- Hand Operated

"EH-1" Machine
- Pressures to 1200 p.s.i. at 100° F.
- Drills ¼" to 1"
- Hand Operated

Write for your FREE copy of Mueller's "No-Blo Methods and Applications" Booklet No. 5.

For additional information and service, consult your Mueller Representative, Catalog G-97, or write direct.

MUELLER CO.
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Factories at: Decatur, Chattanooga, Los Angeles.
In Canada: Mueller, Limited, Sarnia, Ontario

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

Get full details. Send for bulletin 1150.

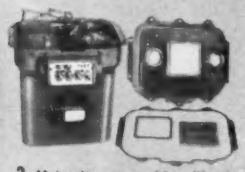
This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

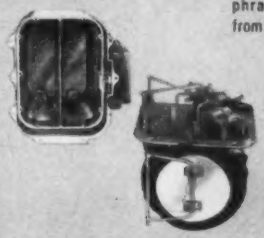
neptune

Look at these advanced design features:

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



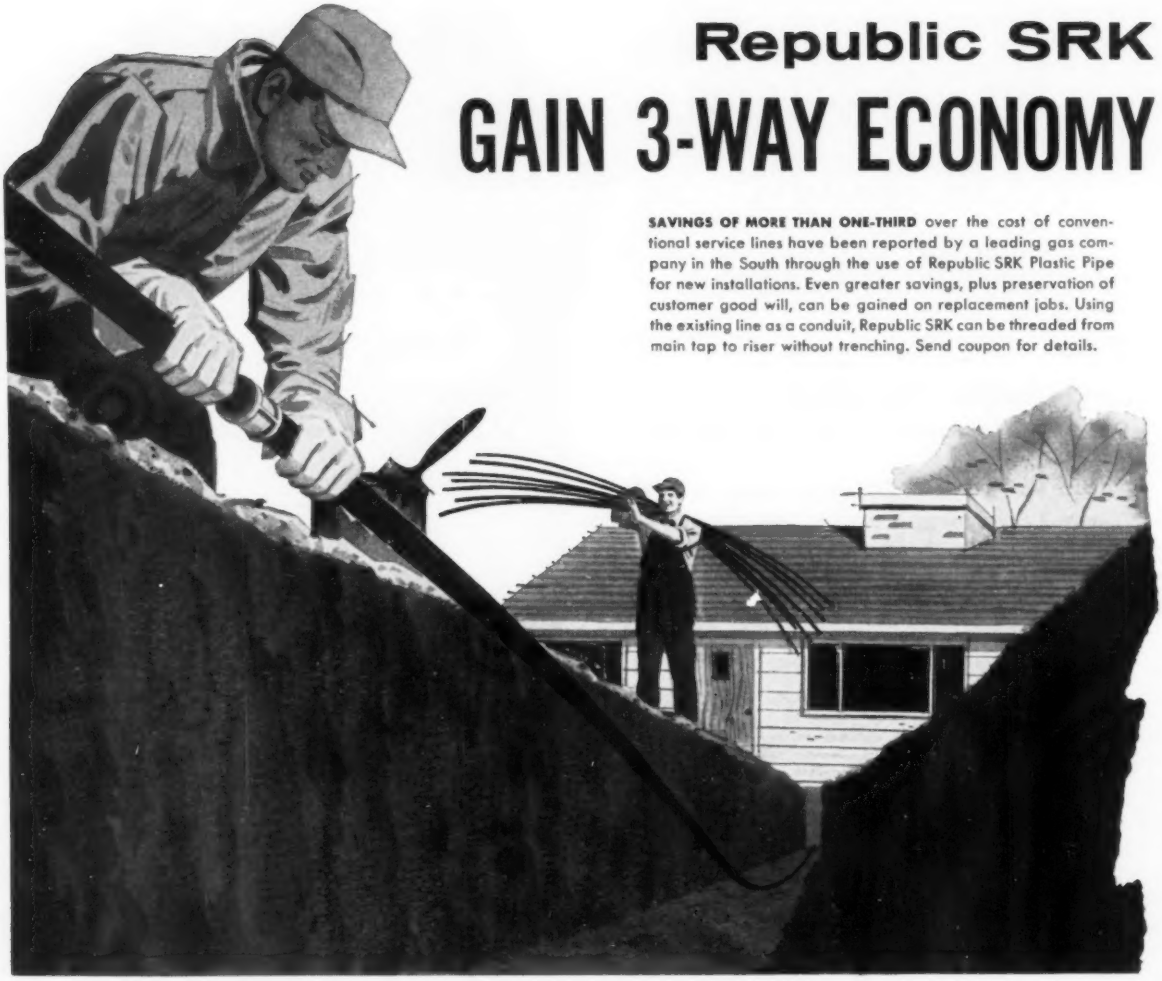
8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.

Republic SRK

GAIN 3-WAY ECONOMY

SAVINGS OF MORE THAN ONE-THIRD over the cost of conventional service lines have been reported by a leading gas company in the South through the use of Republic SRK Plastic Pipe for new installations. Even greater savings, plus preservation of customer good will, can be gained on replacement jobs. Using the existing line as a conduit, Republic SRK can be threaded from main tap to riser without trenching. Send coupon for details.



YOU CAN GET THE CORROSION PROTECTION OF PLASTIC PLUS THE STRENGTH OF STEEL with Republic's new X-TRU-COAT pipe and tubing. Actually two pipes in one, plastic over steel, X-TRU-COAT is ideal for a wide variety of applications in which external corrosion is a problem. The tough polyethylene coating is continuously extruded over a special elastic adhesive undercoat forming a solid, permanent bond with the steel pipe. X-TRU-COAT can be bent and joined by conventional methods. Joints are corrosion protected by a primer covered with pressure-sensitive tape. For details, send coupon.

Plastic Pipe helps you
IN SERVICE ENTRANCE LINES

For new or replacement gas service entrance lines, use of Republic SRK (Semi-Rigid Kralastic) Plastic Pipe enables you to cut costs in three areas:

FIRST—Low initial cost of Republic SRK provides immediate savings in capital investment.

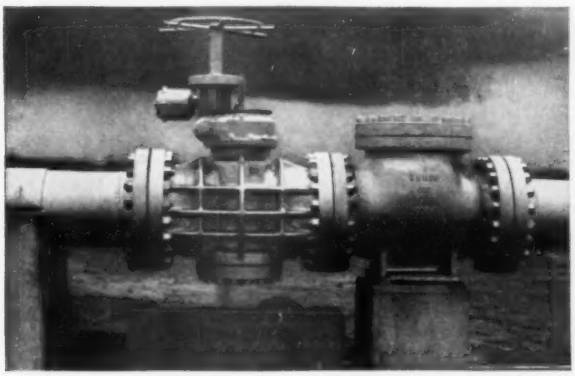
SECOND—Extreme ease of installation provides substantial savings in construction costs.

THIRD—Because Republic SRK is immune to electrolytic action as well as acidic and alkaline soils, maintenance and replacement caused by these conditions are eliminated.

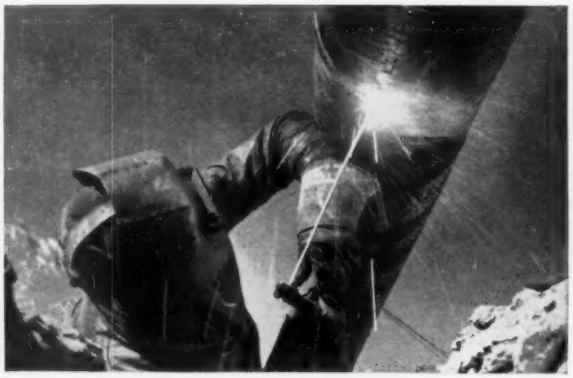
In addition to these cost saving characteristics, Republic SRK has high impact strength to withstand mechanical abuse in handling and installation. Light in weight and readily cut with ordinary hand saws, it is joined by solvent-welded sleeve couplings to form, in effect, a one-piece line of any required length.

Finally, Republic SRK Plastic Pipe in tubing sizes is ideal for renewing existing lines. Trenching can be eliminated by simply digging a hole at the main tap and another at the riser. Republic SRK, joined by internal connectors, can then be threaded through the old line and joined to metal pipe with special adapters.

For full information on top-quality, cost-saving Republic SRK Plastic Pipe, contact your local Republic office or mail coupon.



REPUBLIC ALLOY STUDS and high carbon hex nuts provide tremendous clamping force to assure leak-proof performance in a wide variety of high pressure equipment assemblies. Clean, accurate threads provide maximum holding power, resistance to wear, and trouble-free backoff whenever required. To protect the designed-in reliability of your equipment, specify Republic fasteners. Send for data.



COSTLY WELDING BURN-THROUGHS DUE TO THIN SPOTS cease to be a problem when you install pipe lines of Republic Electric Resistance Weld Line Pipe. Reason is absolute uniformity in wall thickness and concentricity. Accurate line-up for welding is assured. Moreover, high ductility and yield strength simplify bending and provide high pressure dependability. For facts, send coupon.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. GS-5329-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send me further information on:

☐ SRK Plastic Pipe ☐ Continuous Weld Steel Pipe
☐ Alloy Studs ☐ Electric Resistance Weld Line Pipe

Name_____ Title_____

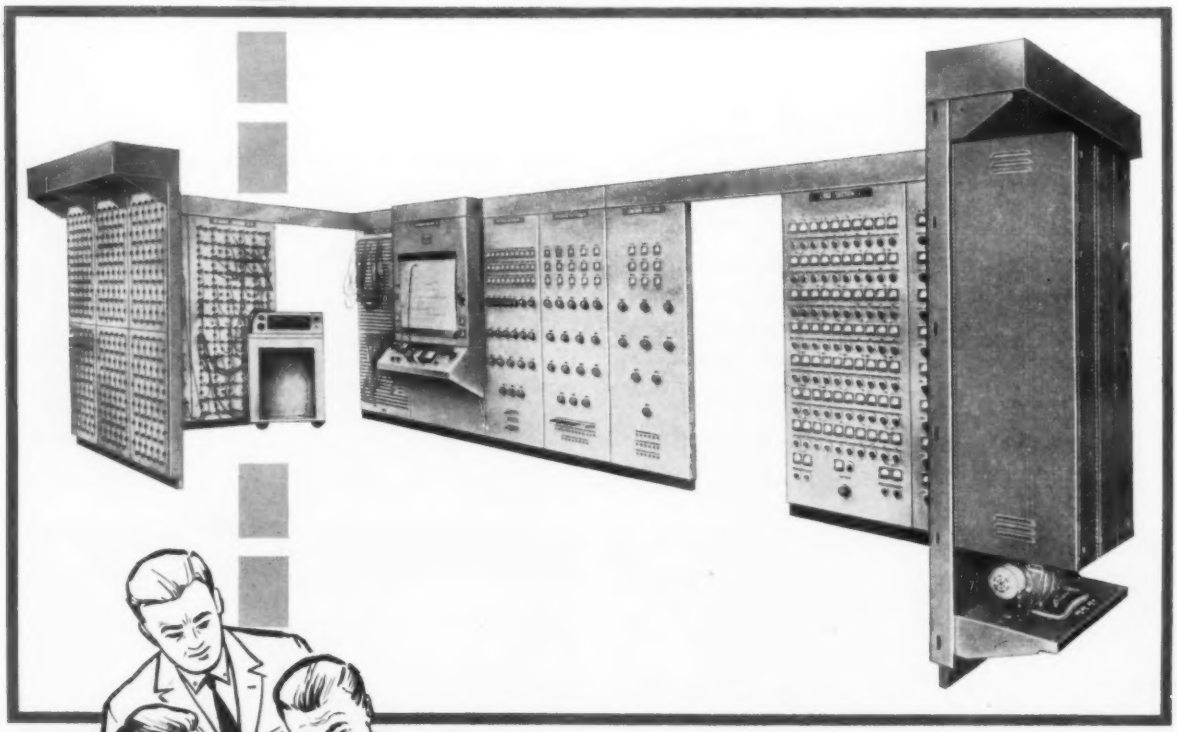
Company_____

Address_____

City_____ Zone____ State_____

how do YOU handle

SYSTEM ANALYSIS?



By careful calculations utilizing fully your engineering training and experience? Or does the pressure of time dictate using "seat of the pants" methods?

With greatly increased work loads . . . continuing population growth . . . and rapid development of suburban areas . . . most engineering departments are hard pressed for time to make adequate, accurate system analysis.

To overburdened engineering departments, the McIlroy Fluid Network Analyzer . . . by STANDARD . . . has been a lifesaver! *Accurate, complete* system analysis that would require *days* of engineering effort is completed in *hours*.

And only with the McIlroy Analyzer can you test your plans *in advance* . . . have a *visual* representation of system condition . . . protect against a wrong guess that can be so costly in materials, time, and labor.

Write today for descriptive Bulletin No. 183

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TRADEMARK

THE STANDARD ELECTRIC TIME COMPANY | **89 LOGAN STREET SPRINGFIELD, MASSACHUSETTS**

ALSO MANUFACTURERS OF:

Emergency Lighting Equipment

Laboratory Panels

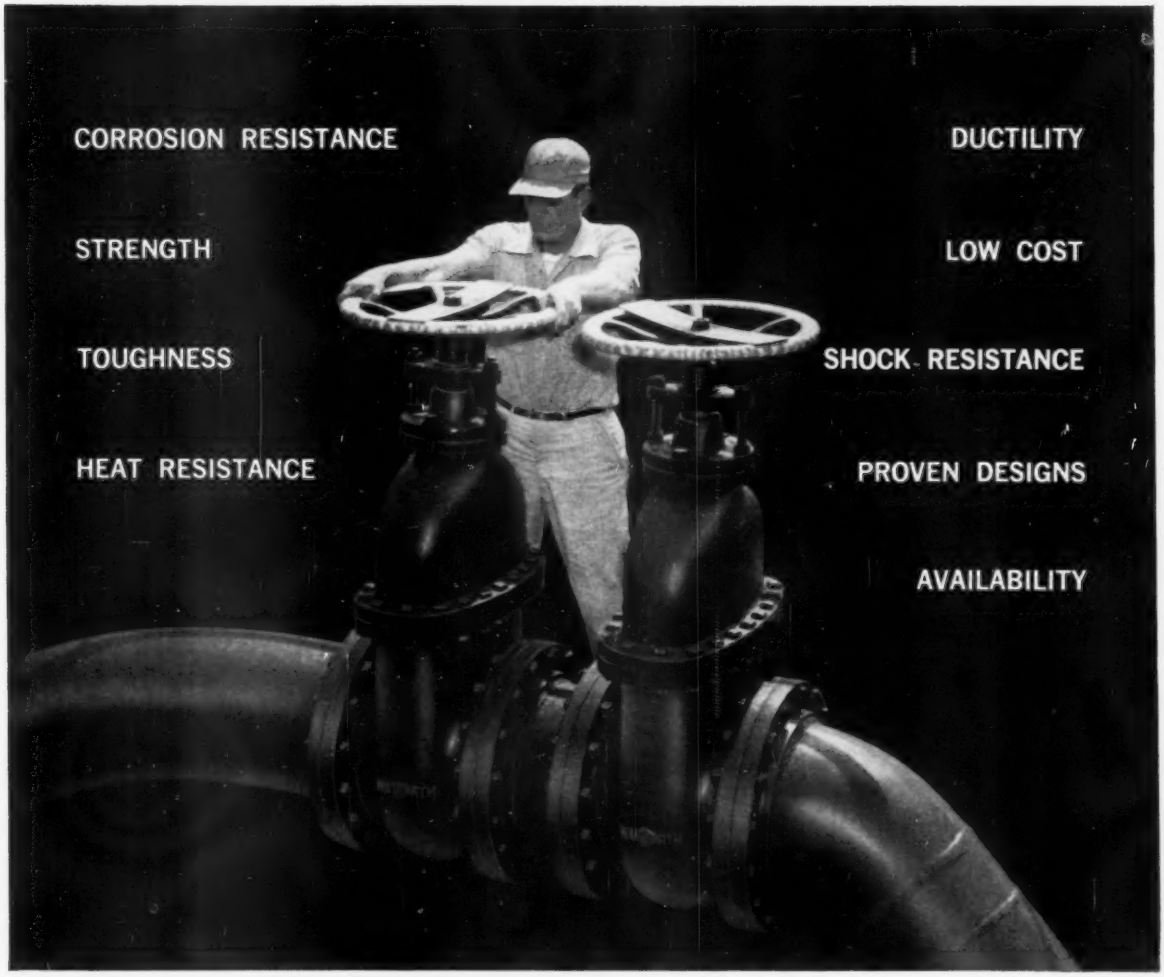
Hospital Signalling Equipment

Clock and Program Systems

Precision Timers

In your gas distribution system you get all these advantages with

WALWORTH DUCTILE IRON VALVES



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Buried underground, National Seamless Steel Bottles are safe from harm. They are effectively protected from storms, high winds and lightning. And there is no hazard to or from aviation.

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it's practical

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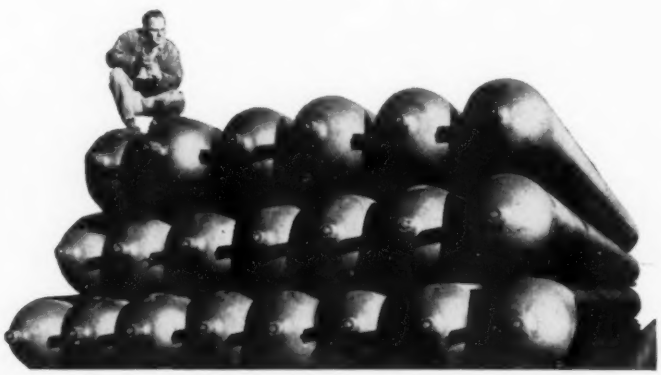
All National Seamless Pipe and Tubes are pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.



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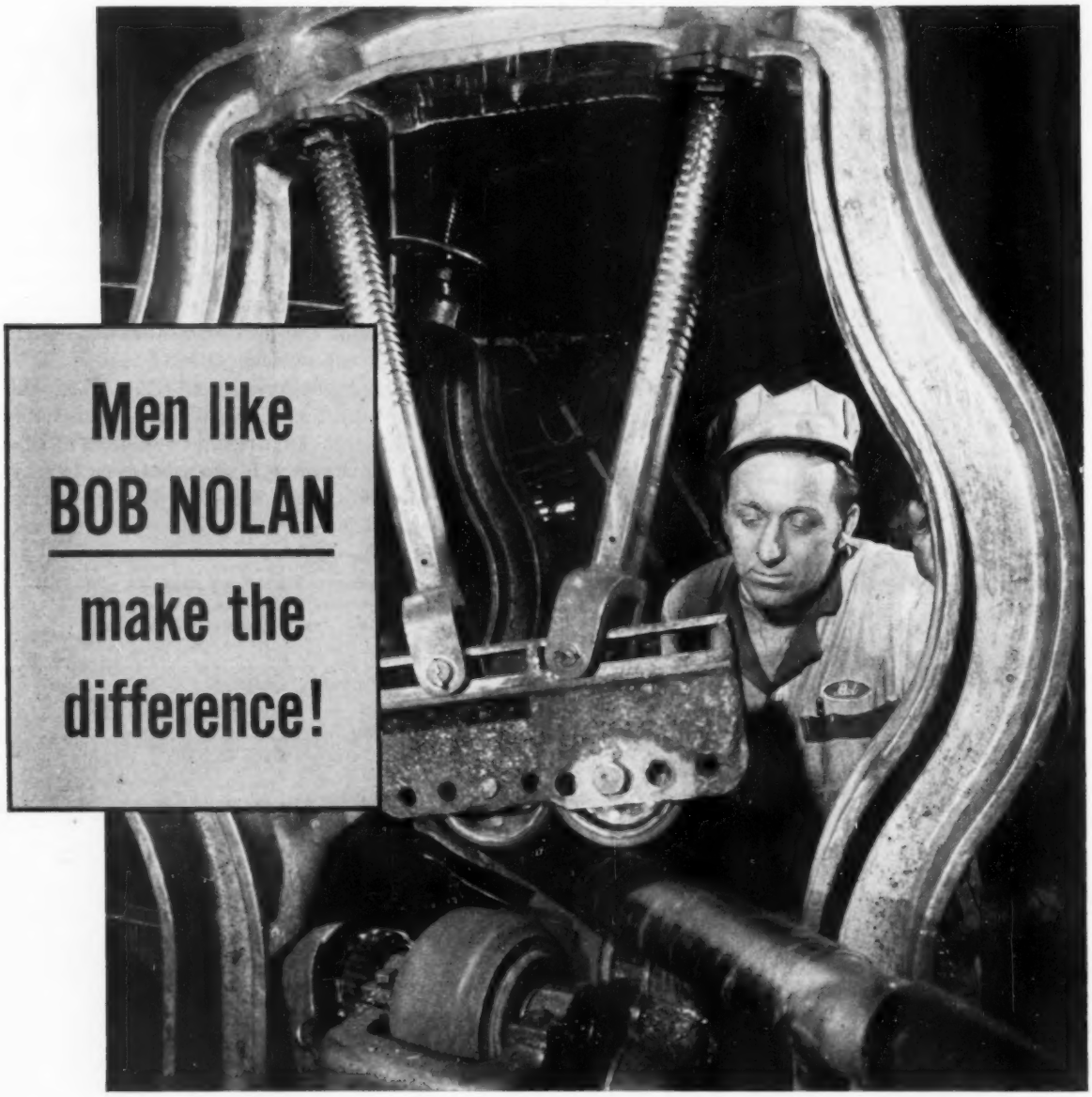

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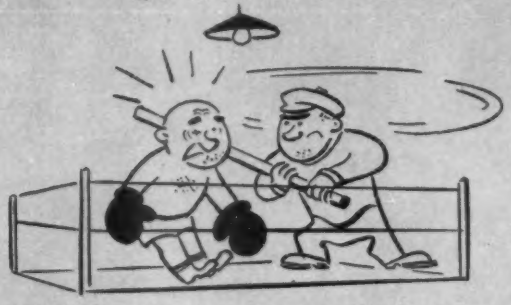
Lightweight with heavyweight stamina



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Kralastic is the tough rubber-resin material (one of the first to produce plastic pipe) that has proved itself not only in natural gas lines, oil field pipe, and valves of any kind, but in hundreds of other tough applications, including water transmission lines.

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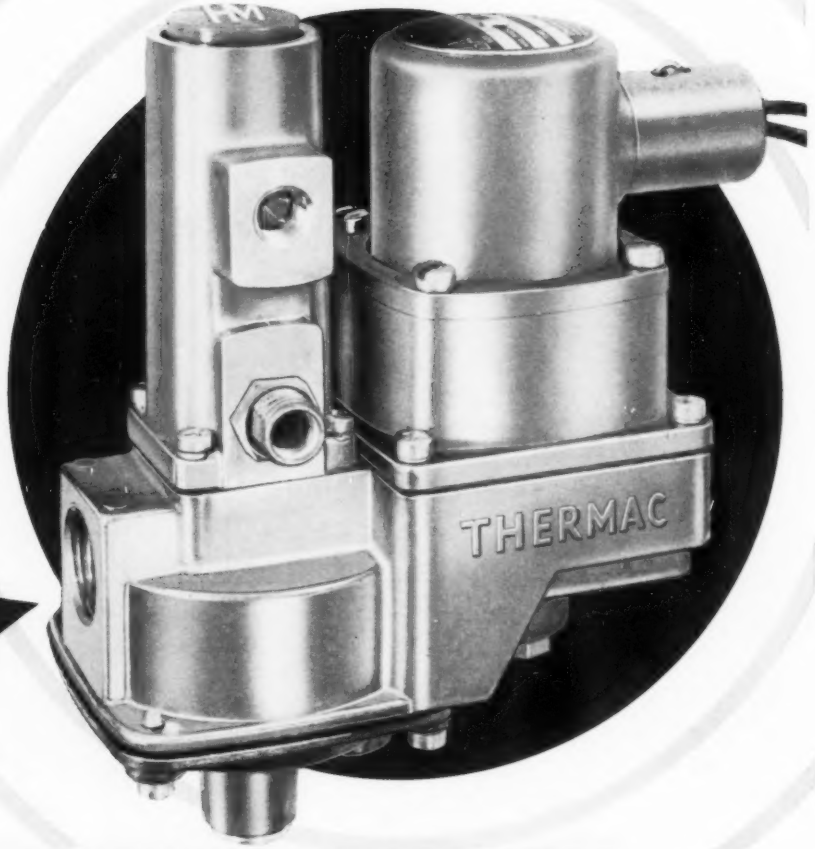

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In a carefully calculated design based on 25 years gas control experience, THERMAC combines in this three-in-one control every feature important to the appliance builder, the dealer, and the customer. Identical in performance and capacity to the now universally accepted SLS-100, it is ideal where space below the control is limited. The unit consists of a regulator, quiet automatic main gas valve and a 100% pilot shut off when required. A manual reset is available in conjunction with automatic main gas valve. Every component is long proven and well accepted in the gas appliance field.

Drawings, prices and samples of the SLS-120 series are now ready for manufacturers interested in reducing the over-all cost of gas control assemblies.

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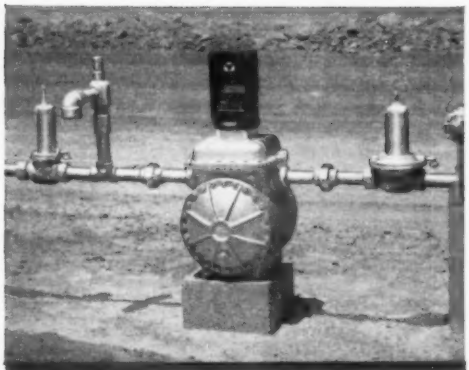
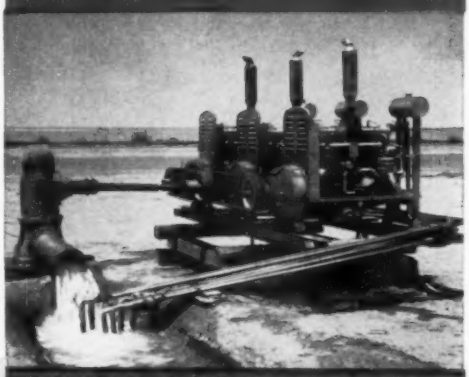
Natural gas powers the irrigation pumps that help farmers served by Pecos Growers Gas Company extend the growing season to 12 months... and costs less than one-half the amount of previously used fuels. More than 360,000 rich Coyanosa and Pecos Valley acres are irrigated from over 1,000 wells 400 to 1200 feet deep.

Gas served to all of the area's 1,000-plus wells is measured by more than 500 American 25B Ironcase Meters equipped with Base Pressure Indexes. Reliance Type HPR Regulators cut pressure from 400 psi to 100 psi before measurement, and again to 25 psi after measurement for delivery to farmers.

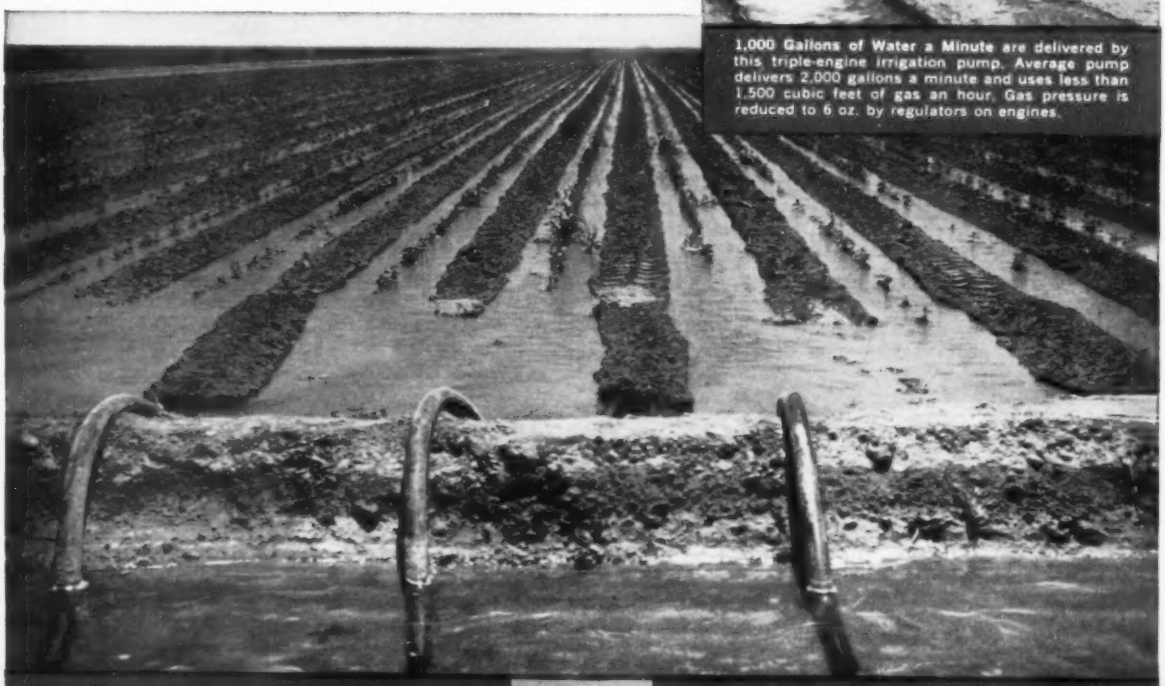
American-Reliance equipment provides reliable service, low maintenance cost, and sustained accuracy under severe conditions. You, too, can benefit by American engineering assistance and American time-tested equipment.



Base Pressure Index on American 25B Ironcase Meter, and Type HPR-10 and HPR-20 Reliance Regulators are installed at each well. Meter-regulator sets are standardized for maximum economy.



1,000 Gallons of Water a Minute are delivered by this triple-engine irrigation pump. Average pump delivers 2,000 gallons a minute and uses less than 1,500 cubic feet of gas an hour. Gas pressure is reduced to 6 oz. by regulators on engines.



35 Gallons of Water a Minute are delivered to irrigation rows through 2 inch plastic syphon tubes which draw water from drainage ditches.

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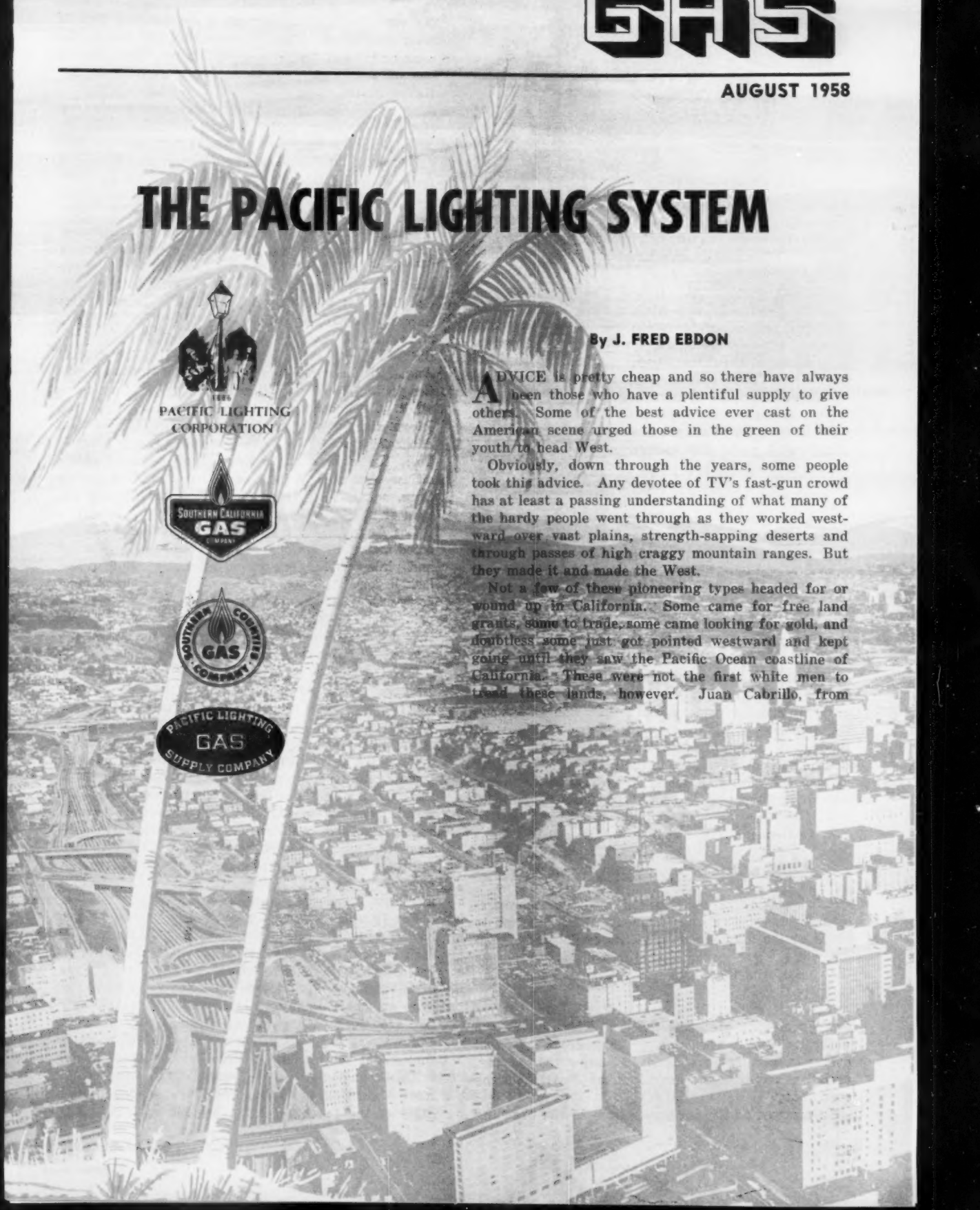
AUGUST 1958

THE PACIFIC LIGHTING SYSTEM



PACIFIC LIGHTING CORPORATION

SOUTHERN CALIFORNIA GAS COMPANY

SOUTHERN COUNTIES GAS COMPANY

PACIFIC LIGHTING GAS SUPPLY COMPANY

By J. FRED EBDON

ADVICE is pretty cheap and so there have always been those who have a plentiful supply to give others. Some of the best advice ever cast on the American scene urged those in the green of their youth to head West.

Obviously, down through the years, some people took this advice. Any devotee of TV's fast-gun crowd has at least a passing understanding of what many of the hardy people went through as they worked westward over vast plains, strength-sapping deserts and through passes of high craggy mountain ranges. But they made it and made the West.

Not a few of these pioneering types headed for or wound up in California. Some came for free land grants, some to trade, some came looking for gold, and doubtless some just got pointed westward and kept going until they saw the Pacific Ocean coastline of California. These were not the first white men to tread these lands, however. Juan Cabrillo, from

Portugal, was one of the first explorers of southern California. He landed in it during 1542. After him, many expeditions—mostly of Spanish origin—tramped around southern California and started its long, spectacular growth.

The migration to this fruitful area was, of course, the prime source of population growth through 1955. However, population generation from within is steadily increasing and experts have predicted that migration is declining. These trends will continue, so it is expected that in the five-year period 1961-65 the natural increase will exceed in-migration.

But in-migration to southern California was the story of the area. Like gas demand, the migration has experienced peaks and valleys. The first peak was produced by railroads building into southern California. Then, as the United States emerged into the Age of the Auto, during the early 20's, masses of people started pouring into California's southland by cars.

John Steinbeck has pretty well chronicled how the hot, dry winds of the Dust Bowl blew another peak migration to southern California in the 30's. World War II produced a later peak. And even the valleys represent a steady, relentless movement to all parts of California, with particularly pronounced trends during the later migrations toward the southern climes of the state.

Through all its development, California produced a legend of a very colorful, half-romantic, adventuresome past. In specific incidents and people, the factual history completely overshadows the fiction. If some of the history were told as fiction, people simply wouldn't feel its authenticity. But in the great majority of its history, the central character was a rugged individual who was willing to face a harsh trek to a rugged land full of promise. For most of the people, the idea of easy fulfillment of the promise soon vanished. However, the promise was still there. It took hard work and intelligent application to reach this promise. It still does.

In the early days, southern California was more frequently passed by than it is today. People tended to settle in the northern part of the state. San Francisco was the "big city." It still is in many ways, as the hub of the Bay Area's industrial and population complex.

The first gold strikes were claimed in and around San Francisco's area of influence. The country was generally lush and promising. Ships from the world over put into its fine bays. It became the roaring, turbulent city that is a legend on the American scene even today.

In contrast to the local-color boys of the brawling early history of San Francisco, there emerged a lasting stability in trade, commerce and banking that is often overlooked. Thus, it evolved to, and still is, the commercial and financial center of the West, and is one of the prime centers for such activity in the United States.

San Francisco has more than its share of flamboyant characters. They, again, cause some to overlook the development of conservative, stable families who produced order out of chaos. Their leadership formed the financial foundation that has resulted in business enterprises that help make the United States second to none in its commercial and industrial life.

One such enterprise is Pacific Lighting Corporation. It was spawned in San Francisco in 1886 and still headquarters there. But, its operating segments—Southern California Gas Company, Southern Counties Gas Company of California, and Pacific Lighting Gas Supply Company—procure, transmit, distribute and store natural gas in the southern California area. Specifically, these companies serve the dynamic Los Angeles basin and the remainder of 14 southern counties in the state of California. Basically, they serve all of the southern California area excepting San Diego county (wherein the important city of San Diego has gas service from San Diego Gas & Electric Co.), the city of Long Beach, and several smaller cities. And even in these exceptions, Pacific Lighting Corp. subsidiaries either deliver all the natural gas used or substantially augment gas supply.

Los Angeles is a great city, a dynamic and complicated metropolis—a city of angels and devils, phonies and philosophers, jesters and geniuses. But if you look beyond its myth of flamboyant screwballs (and some of its reality, too), it is a city of substance and pride, with an awful lot to be proud of. It is a city that does not stand still, ever thrusting outward and upward to better things for its people.

The true image of Los Angeles lies somewhere between the grandeur of Beverly Hills and the fluorescence of Hollywood and Vine. It is a city of contrasts and paradoxes, and it gives you a lot to think about.

But whatever you think about it, the Los Angeles area is the permanent host to some of the nation's largest and most progressive industries. And it is the heart of the largest gas distribution system in the world. The Pacific Lighting System delivers natural gas to 2,255,307 customers (i.e., active meters). At least, that was the figure on Jan. 1, 1958. We could call them now and obtain the larger current figure, but what's the use? Before we had it in type, thousands more customers would have been added.

For 10 years in a row, the Pacific Lighting System has increased its active meters by over 91,000 during each year. So, the southern California area is blanketed by gas operations of the nation's largest gas distributor and, at the same time, the nation's fastest growing gas distributor. In spite of the exceedingly fast growth and the sprawling geography of the giant gas system, adequate gas service has been available throughout the System's service area, without delay.

This, then, is our story—the story of the largest and fastest growing gas distribution system today—the Story of the Pacific Lighting System.

The Men Who Guide the Pacific Lighting System

ROBERT W. MILLER
Chairman of the Board
Pacific Lighting Corp.
Pacific Lighting Gas Supply Co.

ROBERT A. HORNBY
President
Pacific Lighting Corp.
Pacific Lighting Gas Supply Co.

C. O. G. MILLER
Co-Founder
Pacific Lighting Corp.
(1865-1952)

F. M. BANKS
President and General Manager
Southern California Gas Co.

GUY W. WADSWORTH JR.
President and General Manager
Southern Counties Gas Co.

Functions of the companies

PACIFIC LIGHTING GAS SUPPLY COMPANY
SOUTHERN CALIFORNIA GAS COMPANY
SOUTHERN COUNTIES GAS COMPANY
1886
PACIFIC LIGHTING CORPORATION

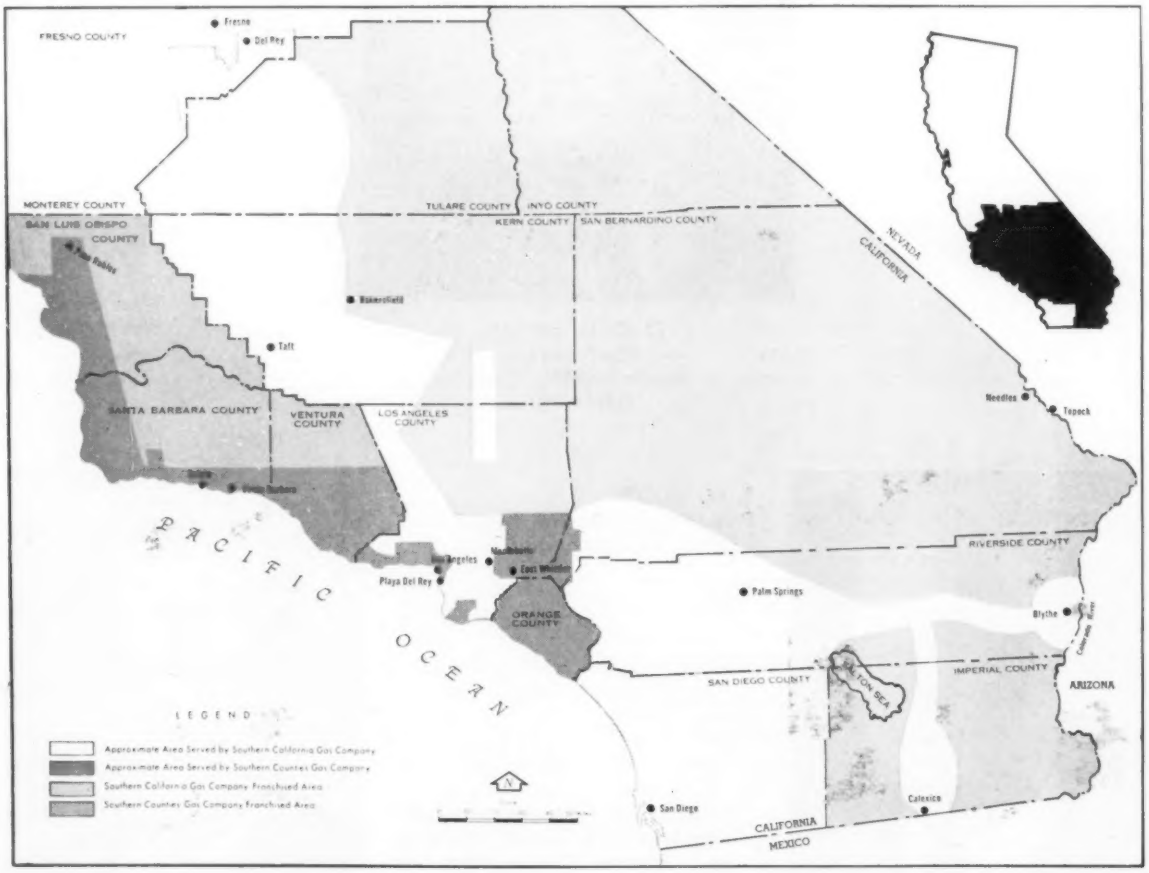
OVERLOOKING neat, sophisticated, cosmopolitan San Francisco from its executive offices at 600 California Street, Pacific Lighting Corp. gazes out over a beautiful city, but its business perspective looks out over all California, focusing intently on 14 of the 15 counties that are thought of as southern California.

As parent company to Southern California Gas Co., Southern Counties Gas Co. of California, and Pacific Lighting Gas Supply Co., it is a service company. As any parent should be, Pacific Lighting is there for counsel when needed. At the same time it represents the investors in the business community of the affiliated companies, and integrates its gas properties with the gas industry on a national basis.

The board of directors of Pacific Lighting Corp. is formed by a group of Bay area residents. Board Chairman Robert W. Miller is recognized as one of the keenest financial minds on the American business scene today. Under his stewardship, Pacific Lighting System has grown and prospered to reach its current position high among the strong, able, well managed gas systems in the nation's fifth largest industry.

Robert Miller is the son of Pacific Lighting's co-founder, C. O. G. Miller. The latter Mr. Miller was

Map shows service areas of SoCal and SoCounties. Inset shows the Pacific Lighting System territory in relationship to California.



truly a gas industry pioneer. He and W. B. Cline formed the corporation to engage in selling gas lighting and gas service for the lighting installations; hence, the origin of "Lighting" in the corporate name. From that humble business acorn, a mighty industrial tree grew.

Pacific Lighting Corp. is a holding company. Its only interests are within the gas industry. This is by choice and not from lack of aggressive leadership. Through the years its officers have taken long, serious looks into other industries for diversification. But in every case, for its own specific conditions and ambitions, the decision has been made that integrated gas transmission and distribution operations alone are best for Pacific Lighting System's health and public service progress.

Most diversification in the gas industry, and particularly in gas transmission companies, springs from the fact that the industry's composite ratio of long-term debt to gross plant is over 50 per cent and to net plant is more than 64 per cent. It is obvious then that some gas companies need cash flow from unregulated-profit type businesses to meet the absolute necessity of such high fixed costs each operating day. This is one factor in favor of Pacific Lighting System's condition as its data for the same ratios are gross 33.1 per cent and net 40.0 per cent.

Pacific Lighting Corp.'s astute, erudite President Robert A. Hornby is a friendly, vital man whose wide business and civic experience have earned him an excellent reputation in his community and in the gas industry. As he sees it, the Pacific Lighting System is a supplier of energy. All of the domestic or international policies ever developed in the world mean nil if geographical areas and peoples lack energy resources.

But southern California has and has had adequate energy resources. Thus, the area is able to produce its current high level of industrial development and a very high standard of living for the millions who live there. The Pacific Lighting System takes just pride in the material contribution it has made to the economic and home lives of southern Californians through always adequate service of the clean, efficient, highly preferred gas energy.

Mr. Hornby points out that Pacific Lighting takes pride not only in the availability of gas-fuel energy, but in the way it has accomplished the job. He stresses the broad foundation of relating southern California's gas-energy supply (now all natural gas) to constructive thinking in terms of North America's natural gas and other fossil-fuel energy resources. It is Pacific Lighting's policy to feel the pulse of southern California's impending growth and equate this with energy requirements far into the future. The family of gas companies has kept ahead of fantastic growth in the past and it intends to keep ahead of that dynamic growth in the future. To do this, more natural gas is required. Pacific Lighting has firm plans for more than adequate gas supply and is planning additional acquisitions in keeping with efficient utilization of overall energy resources.

The System was one of the first gas utilities in the nation to comprehend the need for a sound program of public relations, which has paid rich dividends in winning community liking and good will for the Pacific Lighting System.

Both Southern California and Southern Counties Gas companies have skilled public relations departments which use plant and pipeline tours, lecture programs, publicity of various kinds, house organs and other appurtenances of a sound public relations effort to attain community and employee acceptance and understanding.

Most important to gas operations is Pacific Lighting's policy of customer service. The system has millions of customers with many millions of gas-fired appliances connected to the operating subsidiaries' lines. The basic concept is that the only good gas appliance is one that is producing safe, efficient service. Pacific Lighting companies feel it is their responsibility to service gas appliances in every way necessary to assure customer satisfaction with natural gas service. And from our observation, they don't just talk about good gas service and appliance servicing—they do them. Does it pay? Look at the number of customers and appliance saturations in their service areas.

The question is often asked: Why is Pacific Lighting Corp. located in a northern California city, while the operating utilities are some miles away in southern California? The reasons are several. First, the corporation was formed in San Francisco. Basic moneys invested in it were from some of the fine old families of that Bay Area city and the established financial houses therein. Consider too that when Pacific Lighting was organized, there was not much development in the southern California area.

The early investors did not release these holdings. Generally speaking, the heirs and estates of the original principal stockholders still retain their equity in Pacific Lighting and maintain their homes in the San Francisco area.

Therefore, as a holding company acting as a bridge between the operating companies and major holders of equities and securities, Pacific Lighting remains in its city of origin. Too, another function of a holding company is to raise additional financing for expansion, new construction, new facilities, etc. Pacific Lighting stays in the financial capital of the West where it can maintain closer liaison with financial houses of the area and branches of national or international investment institutions.

One of the parent holding company's basic policies is maximum autonomy for Southern California and Southern Counties Gas companies, and Pacific Lighting Gas Supply. Board Chairman Robert W. Miller and President Hornby will tell you that another reason for Pacific Lighting's location in San Francisco is to let this autonomy continue to function at its maximum.

Flexibility is a prime consideration in the anatomy of the corporate group. Mr. Hornby recognizes that the gas business and the closely allied oil industry are areas where maximum flexibility is requisite from the nature of their operations. He says it is the key to the gas business. Thus, as steps need to be taken, Pacific Lighting System has the flexibility to meet a variety of situations. One of the companies is always

ready to move and can move. Flexibility in the corporate setup is the permitting factor. It sponsors efficiency in each decision as each is taken as it comes.

Southern California industry has exhibited a long-standing demand for large volumes of natural gas under boiler and other industrial utilization. The Pacific Lighting System has maintained adequate firm and interruptible gas volumes for the industrial uses of natural gas so basic to the development and continued vitality of a growing region. As a matter of policy, the System's forecasts and thinking clearly show its intent to be in position to continue industrial deliveries—consistent with fully recognized service obligation to domestic consumers. Again, Pacific Lighting supplies energy and will have energy available from natural gas to fulfill the energy requirements in its service area.

Lest one gain the impression that Pacific Lighting Corp. is a huge organization, we should state here that the entire staff in San Francisco has 19 people. The majority of these are secretaries and corporate-accounting personnel. Contrast this with the nearly 8400 people who staff the operating companies. Officials "commute" frequently to Los Angeles. Both Mr. Miller and Mr. Hornby maintain an office in Los Angeles as well as in San Francisco.

Though the Pacific Lighting System is mature in its development, there is a lot of growing to be done. Pacific Lighting will continue to provide the leadership and inspiration that will mean ever-increasing gas service on which can be founded southern California's drive toward further industrialization and healthy, happy living conditions.

• The operating companies

Southern California Gas Co., Southern Counties Gas Co. of California, and Pacific Lighting Gas Supply Co. are the operating segments of the Pacific Lighting System. The three subsidiaries are public utilities subject to regulation by the California Public Utilities Commission. All operate intrastate.

Southern California and Southern Counties are essentially distribution utilities, while Pacific Lighting Gas Supply concentrates on gas procurement, transmission and storage. However, we mentioned previously the flexibility of the group of companies. This is reflected in the fact that both SoCal and SoCounties operate pipelines, and SoCal underground storage facilities, in addition to distribution properties. Gas Supply, on the other hand, does not have any distribution functions. All three contract for and take gas directly from California producers.

To the uninitiated, this arrangement may seem a trifle complicated. But, just keep these two words in mind—flexibility and autonomy. They are the keys. It reduces to one very major gas system operated by three companies, integrated and interconnected physically, wherein each maintains its operating advantages and identity, to produce maximum efficiency in each part of the over-all system.

Southern California Gas Co. and Southern Counties Gas Co. have entirely different operating territories. The former—popularly known as SoCal—very generally serves Los Angeles proper, the north-south center of the Los Angeles basin and a large part of inland southern California from the Mexican border at Calexico to Del Rey in Fresno county, near the city of Fresno—which actually isn't too southern to most residents of Metropolitan Los Angeles. It skirts San Diego county, in the extreme southwestern part of southern California.

Southern Counties serves Orange county, the San Gabriel and Pomona valleys, and continues along the coastline from the San Diego county line to Paso Robles, near the San Luis Obispo County-Monterey County line.

The map on page 52 makes the whole thing much easier for most observers to grasp.

The three operating companies headquarter in a building complex at 810 South Flower Street in Los Angeles. The building is currently being expanded (see GAS, December 1957, p. 69).

F. M. Banks, president and general manager, and a director, of Southern California Gas Co., and Guy W. Wadsworth Jr., president and general manager, and a director of Southern Counties Gas Co. of California, are now leading their companies through current expansion and growth. These two men are known throughout southern California in particular, and the nation's gas industry in general, for their ability to keep gas service ahead of consumers' needs under the break-neck expansion experienced in the area. They are equally well known for their participation in civic and cultural affairs throughout their companies' service areas, and for their service to the gas industry in several capacities.

Both SoCal and SoCounties have operating divisions that function as limited-autonomous gas companies in their division areas. Each division headquarters has its customer accounting and billing, customer service, new construction, distribution, and, in some cases, pipeline maintenance functions. An operating division will have an average of two operating bases that warehouse material, garage and maintain vehicles and construction equipment, store a working supply of pipe, etc. Naturally, the field crews and servicemen operate out of the bases. Then, both distribution companies have many customer department branch offices

throughout their areas to service consumers' bills, etc. Gas supply, in view of its special services of transmission and storage, has its organization planned on a functional rather than divisional basis. Heads of each of the principal functional groups direct those functions from the Los Angeles offices.

In addition, Southern Counties operates the "Texas pipelines" facilities from the California-Arizona border near Blythe to Santa Fe Springs near metropolitan Los Angeles. This company operates the two pipelines—one that takes a coastal route and one an inland path—which deliver natural gas into the lines of San Diego Gas & Electric.

Southern California Gas operates—in addition to its distribution properties—the northern large-diameter pipeline from the California-Arizona border near Needles to Newhall, just north of metropolitan Los Angeles. It has an underground storage operation at Playa del Rey.

Pacific Lighting Gas Supply is basically a service company to its two customers—Southern California Gas and Southern Counties. It has the vital functions of supplying and transmitting the major portion of the California-produced natural gas to SoCal and SoCounties, and provides large volumes of gas for peak shaving and load equating, primarily from underground storage fields it owns and operates. These are the Montebello, East Whittier, and Goleta storage fields of some fame in the gas industry. This company was one of the first to engineer and operate underground storage of natural gas. Its part in the early development of the art of this method for near-terminal gas energy storage has materially contributed to the widespread use of the technique in the gas industry today.

Before 1947, when out-of-state natural gas was first pipelined into California for the Pacific Lighting companies, Pacific Lighting Gas Supply supplied most of the gas to the two big affiliated distributors. Now, however, when this supply needs healthy augmentation on a peak day, PLGS about matches out-of-state deliveries with California gas and withdrawals from underground storage. In addition Gas Supply operates pipelines from the many California field sources, and built and will operate the new 34-in. OD line from Coles Levee into Newhall. This line will increase the Supply Co.'s ability to deliver large volumes of peaking gas.

Not all of the California-produced gas is handled by Gas Supply. The two distribution companies also purchase and move some "local" gas. Here again, flexibility is exhibited. But it should be pointed out that none of the three operating companies explore for, drill for, or produce either oil or gas.

One of the principal functions of Pacific Lighting Gas Supply Co. is providing more natural gas for the Pacific Lighting System's distributing companies. Here is a recent scene on the new PLGS 34-in. line from Coles Levee to Newhall. Work took place in rugged country along the Ridge Route.

Pacific Lighting's markets

ONE fundamental reason California as a whole and the southern part of it in particular could expand and prosper is the fact that gas energy was there to furnish an important part of the necessary total energy. In the words of others, southern California is booming and gas helps make it grow.

Just how big is the market for natural gas in the Pacific Lighting System service area? The largest in the nation. Exactly 2,255,307 active customers were served by Pacific Lighting System on Jan. 1, 1958. But there are more now. And in addition to being the nation's largest gas distributor by a wide margin, it is also the nation's fastest growing. It has not been at all unusual for the system to add over 100,000 new customers in a year. For the past 10 years, more than 91,000 new customers per year have started using energy from the convenient fuel supplied by either Southern California Gas or Southern Counties Gas.

Where do these customers come from? The world over. But, startlingly enough, the natural increase in population in the Los Angeles city limits and the environs of southern California cities is pressing the influx of out-of-state population for the first time. For the Los Angeles metropolitan area, which takes in Los Angeles and Orange counties, studies indicate that in the period 1961-1965, the natural increase will surpass migration and will continue to do so through the years.

The 14-county service area of Pacific Lighting System holds a population of over 8.6 million at the present time. By far, the majority of these families live in the Los Angeles basin—that complex of cities and picturesque names that spreads out in all directions from Los Angeles' city hall.

The population is not static by any means. Here are some figures that will give a picture of the past growth and the scientifically authoritative estimates of the future. It might be pointed out that earlier estimates—also scientific and authoritative—have always been on the low side.

Year	Population—14 southern California counties
1940	4,300,000
1945	6,000,000
1950	7,300,000
1955	8,400,000
1960	10,050,000*
1965	12,000,000*
1970	13,500,000*
1975	15,300,000*

* Sources: Stanford Research Institute; Security-First National Bank of Los Angeles; California Taxpayers Association.

This is a pretty complete picture of population expectations, but it is not the complete picture of the market. Still to be considered are these factors: First, this is a gas-accustomed population. Gas appliance saturation is much higher in southern California—at least in Pacific Lighting System's service area—than the average of the nation. Southern California and Southern Counties Gas companies' sales people intend for it to stay that way and we feel they will actually improve the situation.

The way the Pacific Lighting System market areas have grown can be seen in this picture of Burbank in 1930 and (next page) . . .

TABLE I. APPLIANCE SATURATIONS IN PACIFIC LIGHTING SYSTEM AREA

Appliances	Saturation in Pacific Lighting System Service Area	Current Sales Ratio Pacific Lighting System Area	National Average
Ranges	90 per cent gas	8.5 gas to 1 elec.	1.5 gas to 1 elec.
Water Heaters	98 per cent gas	78.0 gas to 1 elec.	3.4 gas to 1 elec.
Space Heating	99 per cent gas		

Gas-fired clothes dryers have been promoted and sold very effectively in Pacific Lighting System's southern California area. The ratio there is 1.3 gas units to 1 electric, while the national picture is 2.3 electric to 1 gas unit. In addition, progress is being made on increasing sales of gas all-year air conditioning and gas refrigeration.

Second, southern Californians have a high level of disposable income. This stimulates still further rises in an already high standard of living. Naturally, this has meant more energy consumption. Average gas use per customer has been increasing markedly; however, there is evidence that this is trending toward levelling off.

Third, southern California continues at an exceptionally high rate of industrialization. Here again is a movement that feeds on, can only be realized with, increasing energy consumption. Every indication points to more and more natural gas as the fuel for industry in this area.

Fourth, for domestic purposes and to a large extent for industry, natural gas is becoming either directly or indirectly the only energy source. Sure, there is electric power out here, but most of it is being thermally generated. The trend is toward more natural gas for this application. And all industry—power generation, manufacturing and processing—seeks additional natural gas fuel. This requires explanation.

When a smog alert is predicted or experienced, the Air Pollution Control District requests the gas companies to supply all industry with natural gas. If the smog-producing condition happens during off-peak periods, most industries will be using natural gas anyway. But, even during peak-demand periods, the gas companies will withdraw gas from underground storage and do all they can to supply natural gas for fuel when a critical smog level is reached.

Industry has, of course, spent millions on cleaning up its stacks and most, if not all, prefer natural gas for their thermal requirements because of its inherent maximum-utility qualities and, if for no other reason, to keep the smog-control people off their backs. So you can see that air pollution is a market factor.

Now let's return to the domestic market and take a look at gas appliance saturations in this large and growing gas market (*See Table 1*).

It should be pointed out that these saturations in general reflect installations of quality gas appliances. SoCal and SoCounties have always promoted the sale of automaticity and modernity in appliances. Their policy is that these are the only gas appliances that match the high standard of living which characterizes southern California families. The happy gas consumer is the one with the very excellent top-of-the-line, fully automatic gas appliances. Southern Californians think modern and, as far as gas service and appliances are concerned, this thinking comes from a long-standing, long-range campaign by the Pacific Lighting companies to demonstrate to their public that gas service is the most automatic, the most modern, and that gas appliances open the way for really living modern.

So, we have taken a brief look at the market for natural gas in the sun-warmed, cool-at-night, warm-all-day, all through the year climate of fun-loving, out-of-doors-living southern California. After reviewing the expected population growth; the increasing gas use per customer; the sales attitude of the region's utility companies; and the need for more industrial gas, there can be little doubt but that the yearly delivery and peak days experienced to date will soon fall by the wayside. The market will grow. Care to estimate what gas consumption in the nation's fastest-growing gas market will be in 1975?

. . . the same area today. Note Lockheed Aircraft plant in lower right portion of each photo.

Sales and sales promotion

HOW did this huge southern California market develop? Through hard work and constant, effective selling of a quality product available at a low price. Pacific Lighting's distribution subsidiaries started selling gas service and gas-fired appliances early. They did not wait for some other energy source to start moving its appliances in before they got excited about the competitive advantages of gas appliances, and the advantages of their form of energy.

The sales departments of both Southern California Gas and Southern Counties Gas geared themselves to the concept that the best appliance from the customer's point of view is an automatic, quality appliance.

They were selling and promoting the sale of automatic gas appliances before some gas companies were showing ranges with automatic ignition on their display floors.

The keys, then, to their sales approach are automaticity and modernity of gas appliances.

They started this concept with a clock control program way back in 1932. It was a real deal for the era. Newspaper advertisements and other promotional media and techniques were coordinated in this drive to sell a hoped-for goal of 3000 units. They sold 13,000, which put the range clock manufacturer in a tizzy.

SoCal and SoCounties became convinced at that time that the consuming public wanted automatic and modern gas ranges more than they wanted mere cheap and efficient cooking. They saw this as their approach and, like a bulldog, they have never let it go.

Both companies merchandised appliances during those days. They both discontinued appliance selling during World War II. Southern California Gas stayed out after the war, but Southern Counties went back into gas appliance retailing until they could build effective dealer programs within their service area. Counties ceased direct appliance sales in 1951.

When the electric industry came out with its first built-in ranges, gas company sales and technical people immediately began development work with a West Coast gas appliance manufacturer. Built-in gas ranges and ovens with the finest automatic features were ready for the market by the time the public and new home builders wanted them. Therefore, they were able to instantly start working to reap the advantages

More than 120,000 new dwelling units were built during 1957 in Pacific Lighting System's service area. Here, a field joint is wrapped on a 4-in. main extending good gas service to some new homes.

to gas appliances when the built-in movement was sweeping the area.

They are modest about taking credit for the fact that within the SoCal and SoCounties service territories, gas appliance saturations (see Market) are way ahead of the national averages and reverse the national ratios in some instances. But we feel that credit is certainly due these gas utilities for a fine sales-promotion job.

To do this type of job, Pacific Lighting System sales forces coordinate their sales promotion campaigns. They see it as a four-pronged effort. If one prong is weak, the whole is usually effectively destroyed. The gas appliance manufacturers, appliance distributors, appliance dealers and gas utilities must work together. It is the prime responsibility of the gas utility to design and operate the campaigns in such a manner that the three other segments cannot afford to let it go by. This calls for a complete campaign. A real packaged job including everything it takes to pull the four segments together to sell the public on the automaticity and modernity of new gas appliances.

In a fast-growing area like southern California, working with builders is vital to gas appliance sales promotion. You have to do it in an area that was building 39,000 new dwelling units in 1938; and built 120,000 in 1957. Southern California and Southern Counties Gas companies have building industry representatives constantly working with volume builders. Aiding these specialists are personnel that service small builders and homes built on a custom basis, all promoting gas appliances, the all-gas kitchen and the all-gas home.

Again, it is a matter of furnishing any and all types of aid to the builders—a packaged job. If a builder needs the service, the gas utilities in southern California will design gas kitchens for him. They develop his model-homes program from initial promotion to completion. They work with department stores, suggest advertising campaigns, work out attractions, and are on the site to help the builder when the home-seeking Californians swarm into the area. The gas companies' people put builders in touch with manufacturers who will develop a volume price for gas appliances to go into large tract projects. In short, they do anything and everything reasonable to help a builder see the advantages that homes full of quality gas appliances will give to his sales. After he is convinced, utility sales peoples back him up with the promotion package that brings the prospects to his development or tract.

The Pacific Lighting System's dealer cooperation program is easily stated. It is an all-out effort. They give sales assistance to all 2800 gas appliance dealers in their service area and provide additional support to those dealers who place major emphasis on the display and sale of gas appliances. The utilities display appliances in an attractive, traffic-producing manner. Sales made on their sales floors are assigned to dealers.

Key people in the gas appliance dealer relationship are the dealer representatives. Out here in southern California, these fellows don't have time to worry a whole lot about the electric industry. They are too busy going out and showing appliance dealers how the consuming public in their service area prefers modern, automatic, top-quality gas appliances for comfort and utility. They don't worry too much about how many wieners the electric boys cook with ultrasonic sound waves in a chopped down, jazzed-up radar unit that might be more appropriate up on the DEW line. They show these dealers why gas appliances are better, where the profit is and they help him put that profit in his pockets.

For the appliance dealer, plumber, heating-air conditioning contractor, etc., Cal and Counties dealer reps will arrange sales promotions and contacts. And we go right back to that packaged-job concept again. They train salesmen for the dealers; throw store demonstrations; work up and distribute display kits and gimmicks; design and help install window display. And the gas companies advertise extensively and effectively.

Dealers also reap realistic benefits from a dynamic employee prospect program. The potential sales generated by the thousands under this program are turned over to aggressive dealers. The record clearly shows that dealers make more than one-third of these prospects into gas appliance sales.

And the home service girls are always cooking up a storm somewhere in southern California. There is little need to point out to the gas industry the valuable aid toward wide acceptance of gas service-gas appliances these queens-of-the-kitchen, these attractive, well-educated, ladies stimulate in the many sides of community life they penetrate with their know-how and personality. They show the homemakers in southern California that there is only one road to homemaking —the freedom road that is paved by automatic gas appliances.

Both of the Pacific Lighting System distribution companies have a very earnest desire to work with liquefied petroleum gas dealers in and around their operating and franchised areas. They include LPG dealers in their sales programs helping them get new markets as gas utility lines are extended. While success of these efforts has not been as great as it could be, sales executives of the two companies take pride in the fact that gas main extensions affecting LPG dealers have been worked out to mutual good will and satisfaction. But, these utilities feel there is a real need for closer cooperation.

For the future, things look good. True, appliances are harder to sell today, and they seem to last forever, but gas appliances can be sold. Pacific Lighting System sales vice presidents are convinced that sales prospects for top-quality gas appliances that we have with us today NEVER LOOKED BETTER. And even better gas appliances are on the way as large manufacturers with complete research and development facilities, national advertising programs, and complete lines of gas appliances are joining the gas industry. Southern California residents are well accustomed to the advantages of modern gas appliances, and with quality gas refrigerators and gas-fired all-year air conditioners rapidly resurging, Pacific Lighting System sales people plan to actually develop the maximum from the potential in a phenomenal market area.

Distribution systems

OVER 21,500 miles of distribution main wind about through valleys, up foothills, along canyons, by the shores of the Pacific ocean, and under freeways to serve metropolitan Los Angeles and 14 southern California counties comprising the separate service areas of Southern California Gas Co. and Southern Counties Gas Co. of California. These distribution subsidiaries of Pacific Lighting Corp. bring gas service to more customers than any other gas system in the U. S. Breaking total customers (2,255,307) down, Southern Counties served about 635,307 on Jan. 1, 1958 and Southern California Gas had about 1,620,000 on that date. And total customers has grown since then.

The fact that this gas system has been able to keep up with the unexpected, fantastic growth of southern California is amazing. However, it didn't just happen that the physical system was able to deliver a total sendout of 535.2 billion cu ft of gas in 1957 with a peak day of 1.977 billion. It was the result of recognition of public service obligation coupled with long-range planning, good design, and valid engineering. The Pacific Lighting System can move some gas.

Actually it takes all three operating companies--Pacific Lighting Gas Supply is the third—to assure adequate natural gas supply to southern California. Gas Supply Co. is the focal point for procuring, gathering, storing, and transmitting California-produced gas into the vast network of mains operated by Cal and Counties. PLGS also operates three of the system's four underground storage fields and furnishes load-equating gas for system use.

Actually, Southern California and Counties Gas companies are not true distribution companies in the sense of the word in the gas industry. We normally think of a distribution company as one that purchases gas from an unaffiliated pipeline company and has only the function of delivering it to the ultimate consumer. This is a somewhat classical definition and there are many distribution companies that do not operate exactly in this manner. But, how many have the variety of functions that are within the operations of SoCal and SoCounties?

Both of Pacific Lighting's distribution subsidiaries purchase gas directly from producers. Some of this gas goes directly into system that is logically distribution. Some of this gas goes into systems that are

Then (1925) and now—it still takes men and equipment to get a gas distribution job done.

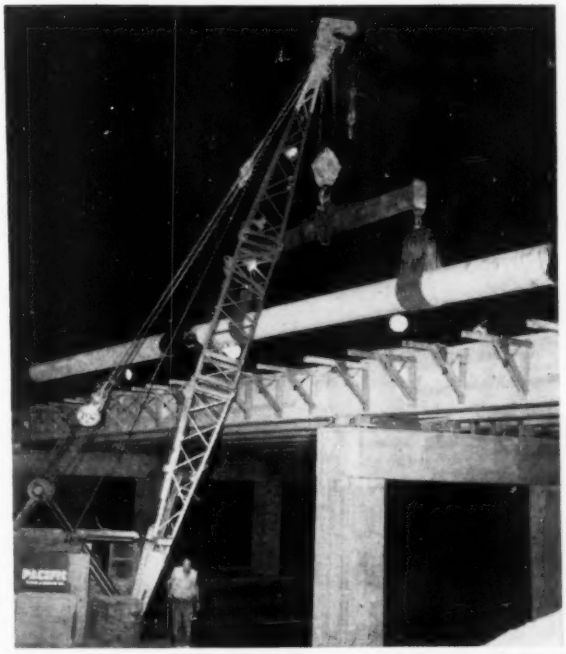
more logically termed transmission. So, both distribution companies operate pipelines, bringing local gas (California produced) into distribution systems.

Some 70 per cent of southern California's gas requirements are purchased from El Paso Natural Gas Co. at two points on the California-Arizona border. Two large-diameter pipeline systems bring this gas to the distribution market area. The southern system—known within Pacific Lighting as the Texas pipeline system—has two parallel 30-in., 215-mile pipelines. One 25,200-hp reciprocating and two 5700-hp turbine-centrifugal compressor stations power gas flow through the Texas pipeline system. These pipelines and facilities are jointly owned by the two distribution companies; Southern Counties Gas operates them.

A northern pipeline is jointly owned but operated by Southern California Gas. This is the Needles pipeline system—246 miles of 30-in. pipe with an 8000-hp reciprocating compressor station. In addition, SoCal owns and operates a 1.5 billion cu ft per cycle underground storage field at Playa del Rey.

So, we see that SoCal and SoCounties do have some variety in their functions. One might look at it this way—all of Pacific Lighting System's southern California service area is a distribution system (less San Diego county and other smaller exceptions shown on Page 52). The "town border stations" are over on the Colorado river that separates California from Arizona and Nevada. Here, out-of-state gas is purchased from a single (at this time) pipeline company supplier, the El Paso Natural Gas system. The Pacific Lighting pipeline systems can be considered huge trunk mains that feed the distribution network. In any case, SoCal and SoCounties—with the invaluable operations and support of Pacific Lighting Gas Supply—get the gas to all of southern California's ultimate consumers in their service areas in adequate supply. After all, that is the most important function. Let us just say that Southern California and Southern Counties Gas companies are very versatile distribution companies, and that the Gas Supply Co. is a versatile service company.

Gas flows into the Pacific Lighting System from the San Joaquin, Coastal, and Los Angeles Basin region fields through a variety of pipelines, and from the great Southwest through the Needles and Texas transmission systems. The Texas pipeline system has a take-off near Desert Center compressor station from which an 8-, 10-, 6-, and 4-in. line plods southward toward the Imperial valley passing just east of the Salton sea to serve several towns in Southern Cal's service area. It terminates at Calexico, right on the border of Old Mexico.



Getting a 20-in. gas main across part of Los Angeles' freeway network is a night-time job.

Further along on the Texas pipelines, Southern Counties Gas Co. operates a 16-in. pipeline that delivers gas to San Diego Gas & Electric Co. at the San Diego county boundary. SoCounties also operates a system that takes gas along the coastline deep into San Diego county in a 12-incher. The Pacific Lighting System makes no sales in San Diego county except the wholesale deliveries to San Diego Gas & Electric. Another instance of the flexibility and variety of functions.

One of the Texas pipelines' 30-inchers joins the distribution system at a key measuring station—Santa Fe Springs, to the southeast of Los Angeles. The more northern 30-in. line in the Texas pair ties in at Puente pressure limiting station slightly northeast of Los Angeles' City Hall.

The Needles pipeline takes a more northerly route to join the system northwest of the L. A. city hall at Quigley pressure limiting and Newhall measuring stations.

These three pipelines handle all of the out-of-state gas flowing to the distribution system at the present time. The California-produced gas is a different matter. As has been noted, prior to El Paso Natural's initial delivery in 1947, nearly the entire natural gas

Special welding truck showing drilling machine, part of complete line stopper equipment carried.

supply for the Pacific Lighting System was produced within its franchised service areas. Hence, local gas supplies are tied in all over the system. There are many fields right in metropolitan Los Angeles. There is also one in Beverly Hills. In short, they feed from within. Some of the local feeds are SoCal, some are SoCounties, and others are PLGS.

Pacific Lighting Gas Supply Co. has a 26-in. pipeline that originates in the San Joaquin valley, then comes into the Los Angeles basin to the Glendale measuring station. SoCal also has a system picking up gas along the same general route but joining the distribution system in the San Fernando valley. SoCounties has a system from the Le Goleta underground storage field.

One of the keys to the distribution system operation is a $11.5 million, 30-in. distribution belt line that completely envelops the Los Angeles basin. From it, feeder mains off-take to radiate both inward and outward to enmesh the heart of the population concentrated in or near the basin with efficient, adequate gas service.

Terminal underground storage is available to the distribution systems from Pacific Lighting Gas Supply's East Whittier, La Goleta and Montebello fields with a combined working capacity per cycle of about 26 billion cu ft, plus 1.5 billion cu ft from SoCal's Playa del Rey underground storage field. The PLGS fields are used for seasonal storage while Playa del Rey is used holder-style to help equate daily or weekly loads.

But these are not the only terminal storage facilities available to the Pacific Lighting System distribution companies. Scattered about the network at strategic points is aboveground storage—the familiar gas holders. Nineteen such stations deliver 105.6 MMcf of high and low pressure storage. These facilities are used in a conventional manner, i.e., filled at night to equate the peaks during the morning hours. Measuring stations are installed at each holder location. And nine holder properties have both measuring and compressor stations integrated for operation. One of these holders, familiar to people in downtown Los Angeles, is a 15-MMcf vessel that has a diameter of 250 ft and towers 380 ft aboveground. Other holders range from 10 MMcf capacity down to 500 Mcf.

The overall control of this distribution network, the pipelines, and the many above and belowground facilities that augment it, is a dispatching center called Spence Street station. Here, SoCal's supervisior of gas planning and dispatching, and intercompany coordinators, control all of the flow operations in SoCal, SoCounties and PLGS facilities. It is truly an integrated dispatch set-up. From Spence street, receipts from production are balanced against requirements of customers, and instructions are issued for controlling volume and pressure in the interconnected system that laces the 14-county Pacific Lighting System service area. El Paso Natural's dispatchers over in Ehrenberg, Ariz. are wired-in as are San Diego Gas & Electric's dispatchers.

Telemetering links most key supply points and two delivery points. Remote control is also highly evident. Valves can be opened or closed from this remote point, regulator settings varied, and the change in flows can be watched on recording charts. Selectivity has been built into the telemetric system so that certain points can be push-button controlled instantaneously during a problem period at these locations.

Actually, Spence street station is a coordinating center as well as a dispatch point. Dispatchers throughout the Pacific Lighting System report in and we have mentioned the El Paso Natural and San Diego Gas dispatchers. So Spence street is actually coordinating all or part of the gas flow in systems of five companies plus the Long Beach municipal system.

The coordinator controls the delivery of gas to division areas, perhaps reroutes gas to specific divisions, delivers to or takes from underground and aboveground storage, orders delivery to or curtailment of interruptible industrial customers, and calls for takes of emergency gas from oil companies with which Pacific Lighting system companies have contracts.

On a peak day, such as the one experienced on Jan. 29, 1957, when the sendout was 1.977 billion cu ft, gas coordination is some job. There was an approximate 50 MMcf difference in the rate of sendout per hour between the high and low points of the day. And let it never be said that southern California does not have "unseasonable weather" that gives the impetus to radical changes in demand from hour to hour possible any day of the year. These are reasons why most of the Spence street personnel have more than 30 years' experience with Pacific Lighting companies. They know they can deliver 5.715 billion cu ft in a three-day period—they have done it. Data are manually logged hourly at Spence street. Communications are all wireline. However, VHF and two

microwave circuits are in operation for emergency service. An engine generator is installed for standby power supply.

After one leaves Spence street station, operations diverge. Each of the three Pacific Lighting operating companies has its own system and techniques. Although they are physically connected, the properties are operated with much more than a touch of individualism. Even the two distribution companies have different ideas about how things should be done. And they do operate differently, too.

This originates from management's policy of flexibility and autonomy. Each distribution company has separate officers, directors, and department heads of both operating and staff functions. Naturally, the same can be said of Pacific Lighting Gas Supply Co. in relation to Southern California and Southern Counties Gas companies. Each of the three companies has its own functions and area of operation. Each takes care of its own engineering, design, construction and operations.

This does not mean that the three entities never benefit from the work of each other. Quite the contrary is true. When an idea, design, or piece of equipment is proven-out in one company, it is made available through constant intercommunications to the others. One or both of the other companies might find the new wrinkle will also work in their operations and adopt or adapt it. The point is, however, that they don't have to. They strive to fit operations exactly to the local conditions in each of the operating companies.

Joint meetings are often held to work out problems that involve all of the companies. For instance, the gas coordinator at Spence street has a step-by-step planned procedure he follows as the gas demand situation changes. Naturally, a change in gas requirements affects each of the three gas system operators. Hence, the program is made by the three companies in meetings. Tolerances are built into the gas coordinating program, but should changes fall outside of the range of tolerances, another three-company meeting is held to modulate the plan. Emergencies can, of course, be handled without meetings, etc.

Both SoCal and SoCounties use about the same pressure classifications in their distribution systems. These are:

Low pressure—inches of water column.
Distribution pressure—In. wc to 60 psig.
High pressure—60 psig and higher.

The companies use single-stage pressure regulation at the customers' meter installations served at under 60 psig. Two-stage pressure regulation is used for pressures over 60 psig, with an automatic shutoff between the two stages.

To illustrate separate operation at its finest, take pipe coating policy. Southern Cal treats and wraps pipe in company owned and operated pipe coating yards. Southern Counties uses contract yards. One company uses a filled asphalt material while the other uses a coal-tar base material. Both use tape for field joints, but one uses a cold-applied material and the other uses a semi-cold applied tape. Obviously, this policy has many advantages. For one thing, each company gains experience with different products and techniques over a long-range study period. They interchange this intelligence at will.

The Pacific Lighting System is serving hundreds of thousands of more customers since World War II with relatively the same number of personnel through application of telecontrol, mechanization, and cybernetics. Southern California Gas has taken the analog route toward distribution system network analysis. It installed a McIllroy Fluid Network Analyzer about a year ago. SoCal system has so many variables in it that analog analysis has proven invaluable for both distribution and pipeline work.

Pipe flows out into the vast Pacific Lighting System every day. Here working supply is loaded on a Southern Counties construction unit prior to its heading out from a division operating base.

Excavating bellhole in distribution system construction with truck-mounted, powered backhoe.

Both companies are exploring the digital approach to network analysis. They have applied several gas-flow engineering problems to electronic data processing equipment used primarily by other departments. They do not have an "engineering" digital computer yet.

Both companies feel they will have to rely on further mechanization, automation and telecontrol in the future to keep up with growth.

Material quality control and flow to the vast, sprawling Pacific Lighting System is interesting. Again, the three companies operate with a "do it yourself" policy. Southern California Gas Co.'s operating center is its Rivera Base; Southern Counties' is its Triggs street station; and Pacific Lighting Gas Supply bases its Los Angeles operating center at Glendale station.

All three of Pacific Lighting's operating arms purchase their own pipe and material. They maintain unusually rigid, scientific quality control and testing of materials. With the distribution companies, the basic stock of supply (excluding pipe) is received and maintained at the operating bases—Triggs street for SoCounties and Rivera for SoCal. Modern materials handling equipment and methods are used. Palletizing is standard procedure, with the pallets being handled by fork lift trucks. Cargotainers are used extensively both for warehousing odd-shaped and small items, and for trans-shipping.

Both the operating divisions and contractors draw material from these warehouses in working-supply lots. Contractors normally do not purchase any of the many items that go into the Pacific Lighting System plant; and, this includes pipe and coating materials.

Requisitions pour into the operating centers from the operating divisions, sub-bases, and contractors each day. The orders are filled and trans-shipping cargotainers placed in areas marked with the company-owned facility or the contractor's name destination.

Early in the morning, the truck drivers find the material scheduled to go out on their routes ready for loading. The utility-owned, semi-trailer trucks fan out on established routes from the operating centers. From SoCal's Rivera operating base, for instance, trucks move material to about 40 different locations every day. A field delivery service is maintained to take emergency items, etc., directly from the Rivera base to a sub-base, or to a crew or contractor at a job site. SoCounties' Triggs street operation is very similar.

Does it take a lot of material to keep two big distribution systems in southern California going? It certainly does. Thousands of items are warehoused. When a fitting, meter, tool, or valve is needed, the proper item must be readily available in a reasonable time. Southern Cal warehouses 7000 different items —1600 items classed as hand tools alone. Southern Counties has 1700 items in its active stock.

At both operating centers, the warehoused material is broken down into stand-by or emergency items, and active items. At SoCal, this inventory is usually about $750,000; while at SoCounties this same figure is some $300,000. The two companies, then, have over $1 million in material inventory.

The active list and pipe are what really move. Triggs street issues active items at the rate of $140,000 per month. Rivera's active item issue is $250,000 per month. This totals $4.68 million worth of this class of material during a year.

As for the pipe supply picture of the two Pacific Lighting System distributors, SoCal has in its yard pipe that cost $1.5 million and SoCounties has another $0.75 million in pipe stock. This makes a distribution systems' stock of $2.25 million. And out it goes each and every day.

In a month, SoCounties will issue $136,000 worth of pipe. SoCal issues about $250,000 in pipe during the same period. This makes a system total of over $386,000 worth of pipe each month.

These are figures that the public can't comprehend. They don't see the picture of joints of pipe going in to replace a retired section of main. They don't see the millions of fittings, meters by the thousands (over 20,000 meters per month flow out of Rivera center; 8000 out of Triggs street), the need for valve replacements, etc. For instance, SoCal estimates that it has over 1400 tons of material in the Rivera warehouse—all needed to keep its part of the distribution and pipeline systems operating.

And it is easy to see why it takes money too. But, behind all of the material flow is the planning. Purchasing, inventory control, scheduling, quality checking, record maintenance—all of these things keep pipe and material flowing into a gas system. It can't be done on the spur of a moment; it all has to be carefully worked out in advance.

About 80 per cent of the new construction in both systems is done by contractors. The more specialized jobs are handled by company crews; the more routine, by contractors' personnel. Each operating division does its own inspecting and hot-tapping on pressures over 35 psig.

Here are a few "operating gimmicks" picked up around the Pacific Lighting System. In some cases, both companies use these; in others, some are used by one or the other of the utilities.

Bell-holing for main extensions, etc., is being done quickly and cheaply with a Davis backhoe (18-in. bucket) mounted on and power take-off-driven from a heavy dual-rear wheel, flat-bed truck. This unit is proving itself in the variety of decomposed granite and other rocky soils found in southern California. A light trencher (Vermeer Pow-R-Ditcher) is also working out well.

One of the companies feels an infra-red leak detector it is experimenting with is going to be a real contribution to distribution leakage survey work. Consolidated Edison, Brooklyn Union, one of the Pacific Lighting companies and others have pioneered the introduction of this electronic device to gas distribution operations. One big advantage is electronic accuracy in sensing and measurement. Another is it is operated from a moving vehicle with ease.

The companies use oxy-acetylene welding on pipe through 3-in. nominal diameter and electric-arc on 4-in. ND and above. Special welding truck bodies have been devised. These have Mueller Line-Stopper drilling machines and equipment, plus special equipment to handle them with ease.

One of the Pacific Lighting companies has for some years been using a system for changing-out meters for periodic repair without interrupting consumers' gas service. This, of course, saves many call-backs.

Quality control, material standardization and evaluation, work measuring and sampling, etc., have been highly developed in these companies. They feel their work in these directions has been very successful.

Contractor's men oxy-acetylene weld ¾-in. steel service line in Southern Counties Gas' distribution area.

Both companies have been using the technique of crushing steel and copper pipe (mostly service lines) to make shutoffs. And experience with reopening copper pipe has been successful. Now, they are working on a procedure for reopening crushed steel pipe, but have not adopted it as a standard operating procedure.

A program is underway to prove-up a procedure for welding steel service lines directly to steel mains. For this work the pipe is field bent into a slight gooseneck a couple of feet from the joint with the main. No tee is used, of course. The economy would be substantial. Those services that had to be replaced or otherwise worked on offer no problem. The technique would be to crush the service in three places a foot or two from the main; then, make the cut between the second and third crush. The service would be tied back in with a service tee permitting a no-gas-blowing operation.

All of these things have contributed to a reduction in time and manpower to accomplish distribution work. Crew sizes have been reduced from an average of 12 men to the modern crew size of two, three or four people.

To keep up with the work in large, fast-growing systems like those handled by the operating companies of the Pacific Lighting System, it takes new ideas and better ways.

For the story of Pacific Lighting's gas supply and pipeline systems, turn to the pipeline section

AUTOMATION SYMPOSIUM

PART 2

AUTOMATION in gas industry operations—1958

By J. FRED EBDON, Editor

PROGRESS is being made in the application of telecontrol and cybernetics to gas industry operations. Like most progress, that for our industry is the product of study times phasing. A step at a time; a thrust into one area to gain experience; a breakthrough here with a withdrawal there; but, in summation, steady, relentless progress toward automatic operations. It is progress that may be thought of as slow-moving—it is progress that will inevitably affect your gas system.

This concept was one of many introduced by a panel of experts at GAS Magazine's Symposium—*Automation in Gas Industry Operations*, held during May in New York City. There, we heard what some gas companies—both distribution and transmission—are doing in the field of automated operations. It was not a meeting in which we aimed to chart the progress of every gas company making use of, or planning, applications of telecontrol - cybernetics. Rather, it was a meeting for review and discussion of what is being done by typical gas companies.

From that point, the meeting members went into the future. And, in their opinion, it is a future that holds a lot in store for gas industry operations with a high degree of automaticity. It is a future under which gas distribution and transmission personnel will find much of the manual work removed. Telecontrol and cybernetics will not displace people or reduce their number. But they will enable gas systems to do more work more efficiently with very slight, if any, increases in the payroll—and, again, personnel will do more thinking and decision making instead of manual work. It is a bright future, a great future, a future wherein the science of man will be applied readily for the benefaction of man.

Will this future actually come to the gas industry? The thinking of those present at GAS' automation symposium indicated that it definitely will. Take a look at some direct statements:

From a distribution company engineer—"It (automation) works for other people, for missiles and what not, why shouldn't it work on a gas dispatching system?"

From a transmission company engineer—" . . . eventually, what we are after is a fully automatic pipeline."

From another distribution engineer—"We're into it (automation) with both feet, and we want to go as far as we can."

From another pipeline engineer—"Don't forget, we're selling this gas up at the far end of the line and picking it up way down south. Our management feels automation is the long range answer to control of these vast systems."

Still another distribution man—"We all experienced about a 100 per cent increase in thermal capacity through conversion from manufactured to natural gas. And I would wager that if we go along—as we have been talking about here tonight—we'll pick up another 100 per cent increase in capacity."

And so it went. Actually, there is somewhat of a parallel between some gasmen's thinking and the court marshal trial of Gen. Billy Mitchell—which is very interesting reading. Some of the testimony (more than 30 years ago) went something like this:

Question—"Do you actually believe that an enemy will be able to fly from Europe to attack the soil of the United States in airplanes?"

Mitchell—"Yes. I know that will be possible in future years."

Question—"General, do you know how wide the Atlantic Ocean is?"

Mitchell—"About 3000 miles."

Question—"And you still say here that aircraft will be able to fly this distance carrying military weapons and operators needed to launch a military attack? Do you know how long it will take them to just fly this distance and return?"

Mitchell—"Yes, I know it. But in the future airplanes will be able to fly faster and higher, while transporting tons of material. They will be able to operate at speeds of 1000 miles per hour or more."

This was followed by general head scratching. Just 30 odd years ago, average minds might have seemed justified in laughing at the then-wild pre-

dictions of an expert. Today, some gas industry people may take this same approach to a fully automated natural gas system. But consider this—like Gen. Mitchell, these men that were assembled for GAS' meeting are some of the forward thinkers in the industry. They have spent a lot of time and effort studying the motivation, application and economy of automation in the gas operations field. If any caution is needed, I would say it is caution before you doubt the progress the gas companies will make in automatic operations in the next five, 10 or 20 years.

• Progress needs motives

To produce progress—and telecontrol and automation are progress when carefully applied to our industry's operations—there must be motives. The motives for automation were explored. Again and again, the idea of operating an existing gas system more efficiently to produce the ultimate performance capacity came up as one of the reasons for turning to automation. This was developed further to cover expected expansion without the need for substantial additions to the personnel force. It was certainly definite that management does not want to displace personnel with machines. But management does want to increase system and efficiency through controlling and logic devices. In basic terms, men can operate a system well, but electro-mechanical devices can do it better under the supervision of men.

Automation removes some of the human fallibilities without removing the human brainpower—the human touch. Automation systems, for example, are not concerned with weekends, vacations, the hourly wage rate, union negotiations, an ill wife at home, or the need for baby's new pair of shoes. This is another motive that drives many gas companies toward more automated operations.

Accuracy is another motive. Now, this includes accuracy of measurement of variables in a gas system as well as accuracy of the current state of a system. Here again humans with conventional methods and devices do a very good job. But the feeling of the group members is that this shouldn't exclude improvement. In the current technology, when really accurate measurement is desired in the laboratory and in the field, technologists turn to electronics or sophisticated mechanical methods. And they use such techniques to feed multiple points data into a central location. They do it with speed so that they know what is happening at the desired number of points simultaneously. The tools of automation are producing these accuracy factors in the gas industry.

Reduction of data is another important factor in any discussion of motives. At key operating points in a distribution system or on a pipeline, information piles up as data flow in—in any way that you please —through efforts to monitor more and more variables from more and more installations. The labor of merely logging such operating data often exceeds the time and effort that are left for manual dispatch and control of the systems. Telecontrol and cybernetics seem obvious forces to break this data reduction log jam that shows a tendency to continue in the path of more overload.

Another motive? To use automation concepts so that gas company people have time to think. It is very important that people be freed from routine, boring work so that they can apply their inventive bent to solving problems, working with customers, finding new and better ways, and learning the truth about theoretical and actual operations in a gas system.

The state of automation in the gas industry at this time seems to focus—in most cases—on two areas. One is the gas dispatcher and the other, pipeline compressor stations. (See Part 1 of this report, GAS, July 1958, page 45.)

Keys to automating a dispatch center in gas distribution work are computing telemetering systems and data logging techniques. Several — actually many of the large, spread-out, progressive—gas distributors have installed computing telemetering systems. Some with and some without data logging devices. They have taken this step into telecontrol because as their systems grew, the dispatchers reached the point where they had little control over the complex residential consumer load and practically no knowledge of the flows and orifice differentials at various purchase meter stations. Since most gas purchase contracts have the "standard" penalty clause in them, telemetered flow data in terms of the basic orifice formula became necessary from both the operating and economic points of view. Hence, the computing telemetering systems permit them to have instantaneous flow data corrected to standard conditions and for the orifice flow constant (basic orifice factor, Reynolds number factor, expansion factor, pressure base factor, temperature base factor, flowing temperature factor, specific gravity factor, supercompressibility factor, and manometer factor).

These data can be telemetered in, along with pressure reduction data, etc., from any number of measurement and pressure control points that you please —and that you can pay for. They are good data to have around a dispatching center in view of the trend to take from more than one pipeline supplier and penalty clauses. For example, one distribution engineer told the meeting that a 1-MMcf overrun with his pipeline company would mean a contract demand charge of some $37,000. If this event happened in January, for instance, with a contract dated Nov. 1, it would mean 10 months' penalty at $3,700 per month.

For a specific case, in addition to the corrected flow data, a dispatcher usually needs to know pressure in the pipeline company's line as it enters a town border station, pressure values in the distribution system after the first and subsequent cuts, information relating to atmospheric temperature and other conditions, and other variables. He should then have facilities to raise or lower setpoints of pressure regulating equipment at key remote points via the push-button technique. This brings at least 12 functions into the telecontrol area. Thus the communications medium becomes critical.

Obviously, you can bring each function into the dispatch center with a pair of leased lines (or one line and a ground). This would run communications above the point of economic justification. Usually, for distribution work, a pair of wirelines is leased and some form of multiplexing is used. With audible tone equipment, for instance, tone signaling transmitters and receivers can handle any practical number of telemetered functions simultaneously on a single wireline circuit. And this gear provides transmission in both directions at the same time. One company I know of sends 24 functions over the same wireline simultaneously. Another company leases 60 wirelines and has nine of them multiplexed —some for 15 function signals on a single wire. There are other methods of multiplexing, of course, but the end result is basically the same.

• **Code system**

A code system is another method that can and is used in gas industry telecontrol work. Information is transferred from one point to another by using a series of characterized pulses on the circuit. The code system equipment counts the pulses, gives each an identification relative to its position in the code, and gives each pulse a character.

While we were on this subject, question of feasibility of microwave radio circuits for telecontrol functions in distribution systems was tossed to the symposium group. The group felt that is entirely practical. Some gas utilities—United Gas Corp., for one, in its Houston distribution operations—have set up experimental programs for evaluation of both VHF and microwave radio for remote telemetering and control of city gate and district regulator stations. The panel felt that they can see no reason why using carrier waves for telecontrol is not a target to shoot at. They took it a step further by thinking in terms of feeding telemetered meter readings directly into a computer to produce purchase meter readings interpreted into master flow data on an instantaneous basis.

For the pipeline companies, telecontrol from a central dispatch center is similar as far as gas purchase measurement in the producing areas and gas sales measurement at delivery points are concerned. The greatest difference, the telecontrol links are much longer. This should not be interpreted to exclude the many more and more complex factors that must be considered in pipeline telecontrol. Distribution system operation is more of a steady state control problem while pipeline operation involves nonsteady state conditions which make their operations more complex.

The panel felt that for either a distribution or pipeline dispatch center that was telemetering in data and providing for remote control of the actuating devices in the field, some form of data reduction and logging equipment is desirable. Picture an office with some 250 functions from about 50 different points flowing into it. To record, monitor, and log these data and provide for remote set-point control of some of the functions would require excessive office space and either several much-too-hard pressed dispatchers or an unreasonably large staff.

Data processing equipment is the obvious answer. You can call such electronic computing facilities automatic or semi-automatic. But, whatever you call them, in these days of complex system operations, many companies need them. Some companies have such installations in operation at this time.

Basically, these systems are specialized electronic computers with both automatic and selective readout or printout. Hundreds of bits of information are constantly monitored. The computer then accumulates, totalizes, and averages the readings if necessary at pre-programmed intervals. Each hour, on the hour, usually, the machine prints out these data on a log sheet. At any time between readouts, the dispatcher can selectively signal for an instantaneous reading of an exact function from any desired point in the telecontrolled system.

Such units usually have provisions for alarming in case of off-normal conditions of a variable. They permit setting limits (both high and low) for the visual-audio alarm circuits in a number of variables. When the state of the variable strays beyond the range defined by the limits, lights flash, bells ring, and claxons clax. Anyway, the computers tell the dispatcher when unusual conditions are being experienced in the system and where the sensing of these conditions originates. Also, provisions are made for the dispatcher to vary the range of the limits of the alarm system as desired. And manual over-ride is usually designed into the data handling systems.

The group of technicians at GAS' meeting seemed well along on the need for and techniques available for telemetering of operating data and relatively simple remote control of flow, pressure, valve positioning, meter run switching, etc. It would seem that most of them have pretty well started into this phase. Much interest was expressed in computer-readout systems, and accuracy considerations in corrected volume rate of flow telemetering.

• **Variables**

One company's plan is to install a computing system where a number of data will be telemetered in involving several variables. The data processing unit (it will probably be a core memory type) will readout a complete log of flow, pressure, holder stock, odorization and other processing data from an individual station. Similarly, with push-button type operation the dispatcher will be able to actuate end devices that set, correct and control the physical operation of the station. This company purchases natural gas from several different pipeline companies, so its approach is to use telecontrol and cybernetics as a local operation, initially. The company will learn and gain experience on these that will produce a grand readout and provide for entire-system control. With this company and other progressive gas companies, it is just a matter of time and study until every cubic foot of natural gas flowing into and out of their systems will be monitored and controlled from a central dispatch room.

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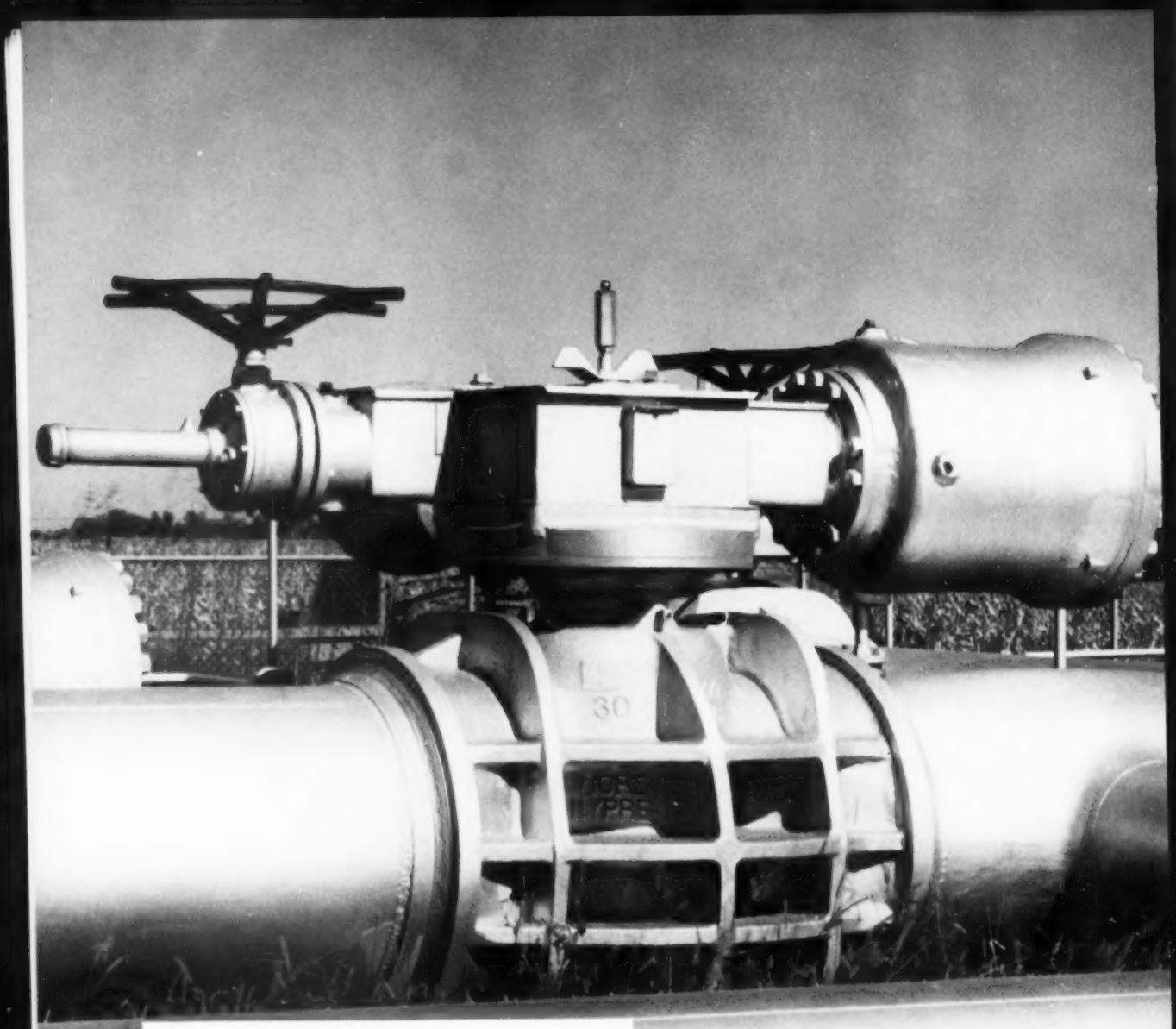

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One company was mentioned that uses a semi-corrected volume rate of flow telemetering system that feeds into a data processing and control system, and uniquely displays system operational state on graphic panels. The graphic panels display diagrammatic representation of measurement and pressure regulating stations. Then orifice meter runs, actuator-equipped valves, and name plates, etc. are backlighted in a color code. So, for instance, when the dispatcher wishes to open (remotely) a valve, he flips a switch. Then, a color shows behind the particular valve symbol on the panel to show that transmission is being made to the valve. If the valve to be actuated is the upstream valve in a meter run, another color code is shown on the symbol. One color indicates if the downstream valve is open; a different color shows if the downstream valve is closed.

In this system, flow is corrected for pressure in the computing telemetering system—square root of the absolute static pressure times the differential pressure. This is the now fairly common type of system that provides for basic calculation for each meter tube with a Bristol Metameter flow transmitter and Dynamaster totalizer that combines the reading from individual meter runs. This feeds into slide-wire receivers. This particular company's set-up takes the slide-wire receivers output to a potentiometer or bridge where a servomechanism positions the product. The servomechanism has an analog to digital encoder integrated with it that feeds data into a Giannini storage device, and from there into a typewriter for readout.

Other companies are actively investigating data processing-readout systems designed for gas dispatching proposed by American Meter—who did its work in conjunction with Arthur D. Little—and Stromberg-Carlson. The trend is toward the building block method where components proved in missile and other longhair applications are tied-in to make a system applicable to gas industry operations. Some manufacturers have enough faith in their components to build a system and let a gas company try it out to prove it in. So, as in all of this automation business, a company gets initiated in steps—there was no doubt in the minds of the panel that this is the wise approach to the subject.

Another facet to the cybernetics end of the meeting is the progress toward automating gas system auxiliaries. One company is already planning in this direction. Right now, they see it for the future rather than as something they will do this year or next. But they are seriously considering computer operation of holder injection and withdrawals, holder heating, remote distribution compressors, and remote propane machine control. The group discussed this to indicate that such plans are practical at this time. However, with this gas company, there are other areas where automation will be applied on a higher priority basis.

The pipeliners at GAS' New York automation symposium displayed the same basic concept as the distributors. They too felt they wanted to use machines for operating, but with the human touch given to all

PARTICIPANTS

M. Anuskiewicz Jr.—Engineer of Development and Planning, Brooklyn (N. Y.) Union Gas Co.
James F. Bell—Executive Vice President, Northwest Natural Gas Co., Portland, Ore.
Gilbert Bowman—Manager, Research and Promotion, GAS Magazine, Los Angeles.
Dave Breslauer—Technical Representative, Barton Instrument Corp. (J. Arthur Moore Co., New York).
Frank Chapman—Publisher, GAS Magazine, Los Angeles.
William W. Clark—Eastern Editor, GAS Magazine, Philadelphia.
David P. Corkill—Electrical Engineer, Northern Natural Gas Co., Omaha.
J. R. Daneker—Product Engineer, Builders-Providence Inc., Division of B-I-F Industries, Inc., Providence, R. I.
Fred W. Deutsch—Sales Manager of Standard & Engineered Products, Builders-Providence, Inc., Division of B-I-F Industries, Inc., Providence.
Fred Ebdon—Editor, GAS Magazine, Los Angeles.
Howard J. Evans—Chief Engineer, Meter & Valve Division, Rockwell Manufacturing Co., Pittsburgh.
R. J. Fichthorn—Supervisor, Microwave Sales, Kellog Switchboard & Supply Co., Division of International Telephone & Telegraph Corp., Clifton, N. J.
A. A. Gandolph—District Sales Engineer, Automatic Electric Sales Corp., New York.
James F. Gary—Vice President, Operations, Washington Natural Gas Co., Seattle.
E. N. Hayes, Jr.—Sales Engineer, The Foxboro Co., Foxboro, Mass.
Raymond E. Jacobson—Director of Marketing, Thompson-Ramo-Wooldridge Products, Inc., Los Angeles.
Duane V. Kniebes—Assistant Research Director, Institute of Gas Technology, Chicago.
Howard L. Ledeen—Vice President, Ledeen Inc., El Monte, Calif.
F. Vinton Long—Chief Telecontrol and Communications Engineer, Texas Eastern Transmission Corp., Shreveport.
R. C. Moore—Application Engineer, Analyzer Section, Standard Electric Time Co., Springfield, Mass.
Bernard Mushinsky—Sales Technical Representative, ElectroData, Division of Burroughs Corp., New York.
Bernard F. Osbahr—Editor, Electronic Industries, Philadelphia.
Abe Propper—Sales Engineer, Hammarlund Manufacturing Co., New York.
W. E. Rufleth—Manager, Telemetering Systems Applications, The Bristol Co., Waterbury, Conn.
E. F. Trunk—Chief Engineer, Laclede Gas Co., St. Louis.
F. M. Van Deventer—Pipe Line Valve Consultant, Walworth Co., New York.
Norman Wagoner—Sales Coordinator, Hammarlund Manufacturing Co., New York.
K. W. White—Engineer-in-Charge, Valve & Regulator Department, Ingersoll-Rand Co., Painted Post, N. J.
Richard L. DeMuesy—District Representative, GAS Magazine, Chicago.
Richard Duffy—District Representative, GAS Magazine, Cleveland, Ohio.
Frank J. Enright—District Representative, GAS Magazine, Cleveland, Ohio.
Joseph R. Geryk—District Representative, GAS Magazine, New York.
Jack Kay—District Representative, GAS Magazine, Los Angeles.
Harold J. Mott—District Representative, GAS Magazine, Dallas.

the machines. They want to use people to think and invent. To be on hand for decisive action in cases of emergency and catastrophe. Automation is a tool for pipeline operations that permits the companies to take full advantage of the abilities of their people. Further, the statement was made, by an outstanding authority on the subject, that a fully automated pipeline can be proven in any time, any place without reducing the manpower in the company by a single man. And the investment in equipment and study will more than pay out. It may surprise some to learn that these statements were not challenged.

A pipeline system has many variables in its operation that make the "big picture" of telecontrol-cybernetics very complex. A pipeline has several to many gas input points. It may pick up gas produced from its own wells in addition to that purchased from many fields and from many producers—which can include other gas pipeline companies, major oil companies, and independent producers. Some wells may be located in different states which could mean that production rates and prorations from different commissions come into meaning. And you can rest assured that the field price will be different in most cases.

Then, on the delivery side of a pipeline, there are generally many natural gas sales points. Some sales contracts say, in effect, take a maximum. Others, say, take a minimum. For business reasons, certain distribution customers will elect to take more than the maximum or less than the minimum, and pay the penalty. Such factors add to the problems.

Between initial point and the terminal point of a pipeline system, other control factors appear. The pipeline company uses some of its gas as fuel gas for compressor station prime movers. These may be reciprocating engines driving reciprocating compressors, gas turbines coupled to centrifugal compressors, reciprocating engines powering centrifugal compressors and, though not to any great extent, even steam turbines turning centrifugal blowers. In any case, efficiencies vary, which means that there are decisions to be made in equating needed horsepower under changing system conditions with fuel gas consumption economy.

And electric-motor powered stations have been turning up in the past few years on long-line natural gas transmission systems. This means different power rates and different power demands for each such station installed.

One of the most important concepts of pipeline operations brought out at the meeting is the lack of actual control by the pipeliners of their systems. The pipeline company has little or no control of the people who purchase the natural gas from them and absolutely no control over the millions of consumers who put it to final use.

Thus, we agreed that pipeline system operation is a complex thing. But the group concluded that this produces an even more pressing need for faster-than-thought data transmission, calculation and actuation.

Gas pipelines have remotely controlled, unattended compressor stations in operation today. From all reports and action in this direction, they seem to be completely practical. A new pipeline which will be the most fully automated to date is on the drawing boards. And older, even mature, companies are turning to remotely operated stations on a step-by-step basis. In most cases, the use of highly instrumented and automated stations is economic, and is the most logical step to improve the gas industry's competitive position. You can't follow other energy industries and stay ahead in competition. The gas industry is leading and should continue to lead in automation to maintain and widen its competitive advantages.

One problem in telecontrol of compressor stations is the application of these techniques to existing stations with older equipment installed. One pipeline engineer offered the thought that when the first pipeline system is fully automated, it will be a new pipeline. He feels it will cost too much to apply automated operation to a pipeline powered by relatively old engine-compressors.

Another pipeline engineer feels that you do, in fact, spend a lot of money when making such a conversion; however, he raised the point that it is hard to evaluate how much of this money is spent for history and how much for actual increased efficiency. He told the group that he is sure a company can go ahead with automating existing older stations and pipelines on the basis that they will lose in the payout on some, but win on the payout of others. He is thoroughly convinced that the gains will outnumber the losses. He hopes to break even on automating quite a few of the older stations which could improve the picture even more.

As mentioned, pipeline compressor stations are the most logical target for full automation in the gas pipeline field since they represent the prime, most complex mechanical assemblies on pipelines. The concept of the panel members is that they function as a reverse pressure regulator. In other words, current designers recognize that the dispatcher will operate a specific station to develop and maintain a desired discharge pressure. In applying cybernetics, then, to station operation, it is logical to start with a station computer that will continuously hold a set discharge pressure that the station is capable of producing in relation to economies in machinery and fuel gas costs.

Thus, each compressor station would have computing equipment on-site that would hold and re-set discharge pressure based on input information such as suction pressure and gas flowing temperature, number of on-line compressors, engine or other prime mover rpm, elevation and atmospheric pressure at the point of prime mover operation, compression ratio for the compressing units, and possibly another variable or two. As these factors that affect the discharge pressure vary, the computer through control and feedback links would adjust the station automatically.

After each station was thus automated, specific operating information would be telemetered into a central computer facility to be equated with feedback intelligence from other vital control points and, thence, to remotely, automatically command and

E. F. Trunk
Laclede

J. F. Bell
Northwest Nat.

D. V. Kniebes
IGT

F. V. Long
TET

J. F. Gary
Wash. Nat.

M. Anuskiewicz
Brooklyn

D. P. Corkill
Northern

control the fully automated system. This concept is directly opposed to the concept that would have all of the computing and control located in a single, central facility. Some symposium participants feel that the local control system will prevail in experience since it is highly suited to the step-by-step approach to automation.

One of the problems to progress in pipeline automation is the lack—in some instances—of distribution company-pipeline company cooperation. Now, there has been much progress in these relations in recent years. As far as automation is concerned, the pipelines need cooperation and mutual trust to enable both parties to rely on such factors as computing billing meters, etc. That will be their source of feedback intelligence for automatic operation and is one of the first things needed.

As one pipeline company symposium member put it, "The dispatcher will have to know what he's sending up the line and selling in either Btu's or cubic feet. This information can be put into feedback channels to our computer—which is coming. The computer would then give the automatic stations, or at least some of them, control-operating information and the stations could then take care of themselves. So the problem is—if we have a problem at all—for the transmission companies to get together with the distribution companies and work together on that."

He went on to say that he believes that within the next year his company will have found a distribution company that is willing to work with them—not to gamble with them—so that his company will be able to have a true picture, and an instantaneous picture, of what the pipeline is delivering to this distribution utility. Then, he feels his company can make the delivery better with the minimum consumption of fuel gas and power through telecontrol and cybernetics. He concluded: "I don't think we really have a problem. I think we all know what to do, we all have the technology, and it will just take some cooperation."

From what we could see and judge at the meeting, it looked like this pipeline company found its distribution customer that is willing to work with it on this very important item of delivery point computing measurement and telemetering. We had a verbal agreement made right at GAS' Automation Symposium. We hope it works out, fellows.

One engineer from a manufacturer wondered if computing meters are accurate enough for billing purposes between the pipelines and their customers. His premise was that the more functional devices that are designed into a measurement device, the more the cumulative error will be.

One distributor reported that the computing metering system he is using in his company's operations is giving accuracy within 0.25 per cent. He feels that such measurement is in the range of what both the pipelines and utilities are interested in for telemetering and feedback intelligence.

This introduced the question of regulatory bodies' attitudes toward this type of gas measurement. Under the class of government the gas industry segments have to work under these days, gasmen go on the witness stand of a regulatory group with a logical story of a project. Then, they make statements that one facet or another of the project is true right down the line—say to seven significant figures. This is followed through into gas measurement, even though the industry knows it isn't always true. One distributor thought that perhaps this is another variable to the automation concept that the panel has overlooked. It was agreed that the FPC has pretty well accepted the automatic concept as it has been built into some pipelines to date, but that the attitude of city councils and public utility commissions will probably show widespread variance.

Another gas distribution engineer pointed out that the PUC in the state of his company's operations is vitally interested in consumer meter accuracy, billing, and so on, but it hasn't taken any active interest in measurement between the pipeline and its utility customers. He sees no reason why gas suppliers and purchasers cannot work together for an arrangement whereby computing meters and telemetering can be used for billing.

One pipeliner at GAS' meeting was amazed by the whole question of accuracy of computing meters and telemetered information. He wanted to know who is comparing who? He feels that accuracy of unattended meter stations and telemetered information is far more accurate than some of the "gadgets" the gas companies work with now and manually integrated charts. It is a matter of who can say computers are not accurate enough on the basis of standards for measurement and orifice meter equipment the industry now has. He made the statement ". . . you don't know—you don't have the least idea if your so-called measurement standards are accurate or not. So how can you say computers and telemetered data are not." He sincerely believes we should say that the computing meters, and information telemetered therefrom, are the standard; and ask ourselves are current manual meter practices

good enough? He was backed up in this by some of the panel members who recounted numerous instances of neglected meters and meter runs, chart pens with a dry ink supply, charts torn or shot off of meters in the field, lost charts, human errors to escape embarrassing discoveries, etc., etc.

One top technical man from a leading manufacturer made the statement: "I think very definitely that computing meters will produce a better signal than one can integrate off of a chart, as far as accuracy is concerned." Another manufacturer's engineer told the meeting that his company checks a lot of computing meters with manometers of established accuracy, deadweight testers, etc. They feel the computing meters are then correct. But, then—in some cases—they check the proofed computing meters against a pipeline company's billing meter charts that have been integrated by hand and they find the computing meter is high or low. Probably, again in some cases, they have to "fiddle up" the computing meter—which they feel is correct from their exacting tests—to agree with the manual meter. That is all wrong, they know, but it seems to make everybody happy.

The use of computers for both distribution network analysis and pipeline simulation was discussed. One distribution engineer related his experience with an analog network analyzer. First, he had to sell management on the theory that the computer would save engineers time and headaches—it would pay out on the basis of manpower saved. But it didn't work out that way. He had six engineers working on system design prior to putting in the analyzer. Now, he has 18. One might say his company didn't save anything.

But consider this: For years this company designed so that there was 10 psig in the tail ends of the system so that the last customer would be assured of about 2 psig. After applying this analog machine for a few years now, the engineers design toward getting 4 psig into the tail ends and with that they know—they really know—that the last customer will be served gas at 2 psig. He pointed out that in his company's system which has grown from 100 to 500 MMcf/day in about eight years, the system analysis which permits them to design as mentioned, has saved the company an awful lot of money while taking many assumptions out of system engineering and operations. In his words: "It's a good way to do the job."

Another distribution man spoke up with these words: "It is particularly interesting to me that you started out with six men and now have 18 men and the analyzer. The case is very similar to that for all of these tools and instruments a gas company puts in. One puts them in on the basis of certain justification. But the more a company uses them the more uses it finds for them. Pretty soon, in the case of electronic network analysis, you can't do without it."

The panel generally agreed that on the subject of distribution or pipeline system analysis, there are two problems: (1) what can you do now to take care of now, and (2) what will you have to do now and during the next few years to take care of tomorrow. Network analysis with electronic computers or analyzers seems to be the best—the only real—answer to operating presently installed plant most efficiently and planning most efficiently for the future.

A manufacturer's engineer asked one of the pipeliners present if he (the pipeliner) would be interested in a simulator that would give the company a model of its pipeline system. The simulator will behave like the particular system that is its subject; compressor stations and their operations will be represented; loads will behave like loads; and gas supply sources will behave like sources actually do. This will be an analyzer that can be contained in a reasonably sized room. On it any future loads, past loads, and conditions that you want to study in the pipeline can be represented and varied to desired points. Measurements of pressure and flow anywhere in the system under any conditions set up can be accomplished. Some of the fellows seemed surprised to learn that such an analog device is available at this time. The pipeline engineer thought his company would have to be interested in such a device.

One very interesting side topic developed at the meeting was telemetering from rotary meters, such as those made by Roots-Connersville. One engineer reported his company does this by use of an American Meter base volume index which, in turn, telemeters to a counter. Essentially, this uses a contacting device on the side of the base volume index and sends it through the communications medium as a pulse count. It was brought out that Roots-Connersville can put a Weston magneto on the rotor section of the meter. This feeds into a potentiometer, from which signals can be readily telemetered.

It was plain to us that there is a definite need in the gas industry for some looking ahead. Both distribution and pipeline companies tend to spend all or most of the time of their engineers and design people in thinking about today. Tomorrow should be considered today. Planning for the future should be done today. It was mentioned at GAS' New York symposium that the big problem in telecontrol and cybernetics in gas industry operations is that we haven't learned enough about these techniques and just exactly how we are going to use them. It was agreed that the equipment, components and systems for full automation are available today. But, we have not figured out just what automation is going to do for the gas industry. Each operating company knows what it is doing now and makes comparisons based only on current and past experience—the future is not realistically considered. We don't study and attempt to see far enough ahead.

It makes good sense to let electronic and mechanical devices take over routine monitoring, recording, logging, actuating, sensing, resetting and alarming functions to form a fully automated gas system. As it has been said over and over again, this frees men to use their rationalizing powers. The gas industry should not waste personnel. Men are too valuable. They are valuable because they can observe physical things as well as data and signals, they use a fine logic system to render decisions. They can put mechanisms and instruments to work for them. ■

What the serviceman should know about . . .

GAS CLOTHES DRYER CONTROLS

By E. W. WECHSLER, Manager, Technical Sales Division
White Rodgers Co., St. Louis

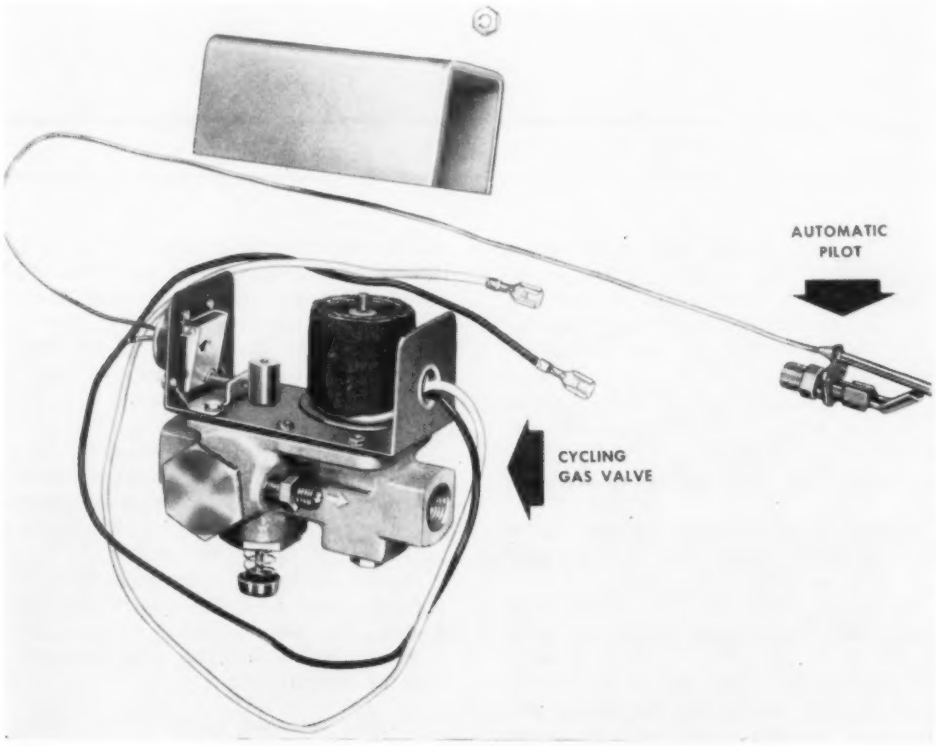
Part 2. Standing pilot systems

(Last month, Mr. Wechsler discussed electric ignition controls for gas clothes dryers.)

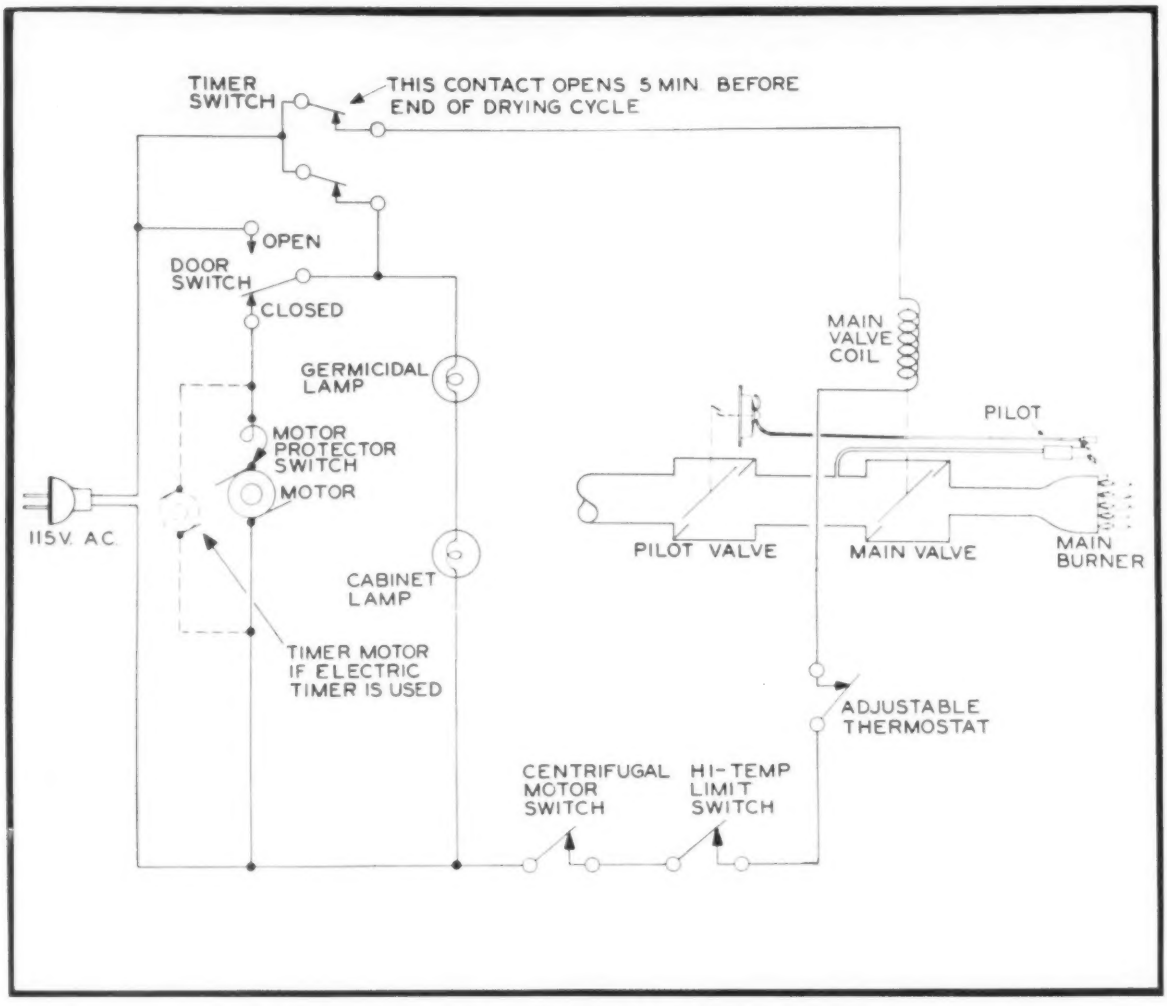
FROM an electrical standpoint, a standing pilot system is somewhat similar to an electric ignition system. It may also be simpler to understand and service because there are less components involved.

• Automatic pilot

The heart of a standing pilot dryer control system is the pilot itself. The pilot is used in conjunction with a mechanical valve, once again giving 100 per cent shut-off. A standing pilot is just



Components of a standing pilot system for gas clothes dryers.



Wiring diagram showing general characteristics of standing pilot system.

what the name implies, in that once it is lighted, it is intended that it will remain lighted at all times. It differs from an electric ignition pilot, in that it is ignited only during the drying cycle. By the nature of the fact that standing pilots are lighted continuously, they usually have a lower Btu rating than an electric ignition pilot, because of the necessity for keeping the dryer cabinet temperatures down, during that period that the dryer is not in operation, and also because of economic considerations.

Standing pilots are practically always lighted manually. It is usually necessary to light the pilot with a match, while holding down a button or some other lever mechanism, until the pilot is energized. The mechanical valve incorporated with the pilot controls the gas to it. When the button or lever is pressed, the mechanical valve passes gas to the pilot. The pilot is then ignited by the match, and heats the thermal element, which may be either a hydraulic action or a thermocouple type. The button must be held down for a period specified by the manufacturer, or until the pilot is energized. The only signal indicating that the pilot is energized is the fact that when the button is released, it remains lighted. If for some reason it has not lighted satisfactorily, or the button has not been held down a sufficient length of time, the mechanical valve will again shut off gas to the pilot when the button is released. The same situation holds true if there is a pilot failure at a later date, for when the pilot flame is extinguished, and the thermal element cools, the mechanical valve will shut off gas to the pilot.

Standing pilots, for the most part, operate with a fixed orifice sized for a particular gas. In some systems, the same orifice is used for all gases with a needle valve for the pilot adjustment at the time of installation.

- **Cycling solenoid valve**

As in the case of an electric ignition system, there

STANDING PILOT SYSTEM

Step from cold start	OBSERVATION				POSSIBLE CAUSE	HOW TO CONFIRM CAUSE	POSSIBLE REMEDY
	Cabinet Light	Motor	Pilot Flame	Main Flame			
1.	- - -	Running	No. Pilot gas will not ignite.	No	No, or Insufficient Pilot Gas Caused By: A. Main line or pilot gas cock closed.	A. Check visually.	A. Open line, or pilot gas cock.
					B. Air in gas line.	B. Lighter blows on attempt to ignite.	B. Bleed air from line.
					C. Blocked pilot orifice.	C. Remove and inspect orifice.	C. Clean with solvent.
					D. Low gas pressure.	D. Check pressure with manometer. Should be 3" to 3½", (11" LPG).	D. Check line pressure. Notify utility if low, or replace LPG tank.
					E. Blocked pilot port.	E. Visually inspect.	E. Clean ports.
2.	- - -	Running	No. Pilot will not stay lighted on release of button.	No	Pilot Flame Insufficient To Heat Bulb Because: A. Low gas pressure.	A. Check pressure with manometer. Should be 3" to 3½", (11" LPG).	A. Check line pressure. Notify utility if low, or replace LPG tank.
					B. Dirty pilot orifice.	B. Remove and inspect orifice.	B. Clean with solvent.
					C. Incorrect orifice.	C. Check orifice size with instruction manual.	C. Replace with proper orifice.
					D. Partially blocked pilot port.	D. Visually inspect.	D. Clean ports.
					E. Yellow or poor pilot flame.	E. Visually check flame.	E. Clean primary air holes, or lint screen.
					F. Pilot shield out of position.	F. Visually inspect.	F. Straighten pilot shield.
					G. High temperature limit in pilot circuit open.	G. Hold mechanical limit closed manually, or short out limit terminals in thermocouple circuit temporarily.	G. Replace high temperature limit mechanism.
					H. Blocked exhaust causing pilot to snuff out.	H. Inspect lint trap and vent pipe.	H. Clean lint trap, and vent.
					I. Thermal element broken or damaged.	I. Visually inspect element.	I. Replace pilot switch assembly or thermocouple.
3.	Off	Not Running	- - -	- - -	A. Dryer unplugged.	A. Check electrical connections.	A. Restore power to dryer.
					B. Open fuse.	B. Observe fuse.	B. Replace fuse.
					C. Open circuit in timer.	C. Check continuity thru thermostat timer contacts.	C. Clean timer contacts, or replace timer.
4.	On	Not Running	- - -	- - -	A. Motor overload protector open.	A. Check continuity thru motor overload protector.	A. Replace motor overload protector.
					B. Door switch contacts open.	B. Check continuity thru door switch.	B. Replace door switch.
5.	- - -	Running	Yes	No	A. Open circuit in cycling thermostat, or high temperature limit.	A. Check electrical continuity thru thermostat and limit.	A. Replace thermostat or limit.
					B. Open circuit to main burner valve coil.	B. Check electrical continuity to main burner valve coil.	B. Repair open circuit, or replace coil.
					C. Open circuit in door switch or timer contacts.	C. Check continuity thru door switch or timer contacts.	C. Replace door switch. Clean timer contacts or replace.
6.	- - -	Running	Intermittent. Pilot gas snuffs out when main burner comes on.	Intermittent. When main burner comes on, pilot goes out. Then main burner is extinguished also.	A. Low gas pressure.	A. Check with manometer. Should be 3" to 3½" (11" LPG).	A. Report to utility, or replace LPG tank.
					B. Main burner starving pilot because of operatio i of pressure regulator.	B. Check regulator for sticking or failure to act quickly.	B. Gently tap regulator. If condition persists, replace regulator.
					C. Incorrect orifice.	C. Check orifice size with instruction manual.	C. Replace with proper orifice.
					D. Dirty pilot orifice.	D. Remove and inspect orifice.	D. Clean with solvent.
7.	- - -	Running	Yes	Yes. Chattering or buzzing main burner valve.	A. Low line voltage.	A. Check with voltmeter.	A. Report to utility.
					B. Poor electrical connection.	B. Check electrical continuity thru all connections, particularly to main burner valve.	B. Repair poor connections.
					C. Dirt on valve plunger, or in plunger tube.	C. Remove valve head and inspect.	C. Carefully clean plunger, tube, and valve seat.
8.	- - -	- - -	- - -	Main burner does not close when power is disconnected.	A. Dirt on valve seat.	A. Remove valve head and inspect.	A. Clean valve seat carefully.

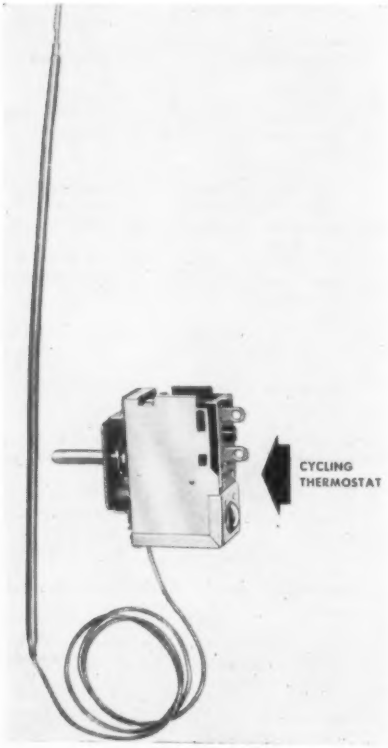
is a main burner valve, or cycling solenoid valve, which operates at the command of the timer, the thermostat, and the limit. The latest models of standing pilot dryer controls include the cycling valve in the same casting with the mechanical valve and pilot switch. The cycling, or main burner valve, will not open when the pilot is not lighted, in addition to those periods when the drying cycle is completed, or the temperature is up to the thermostat setting in the drum, or for some reason the high temperature limit switch operates.

• Cycling thermostat

Again, as in the case of an electric ignition system, the cycling thermostat or one or more fixed setting thermostats controls the drying temperature.

• High temperature limit switches

High temperature limit switches are also found in various locations in the dryer. Some systems also include an additional limit in the mechanical system of the pilot, so that if the main burner valve should not close satisfactorily, the pilot mechanism will be tripped, cutting off both main burner and pilot gas, and preventing overheating of the dryer.



Cycling thermostat

• Gas pressure regulator

A gas pressure regulator, usually set at 3½-in. wc, is also in the standing pilot system. Here again, it may be a separate regulator, or an integral part of the pilot valve and main burner valve casting. LPG systems operate at 11-in. wc, with the regulator included in the tank system.

• Other components

The timer, door switches, centrifugal motor switches, and other components identified with an electric ignition system, can also be found in a standing pilot system. Here again, the entire control system operates from 115 v.

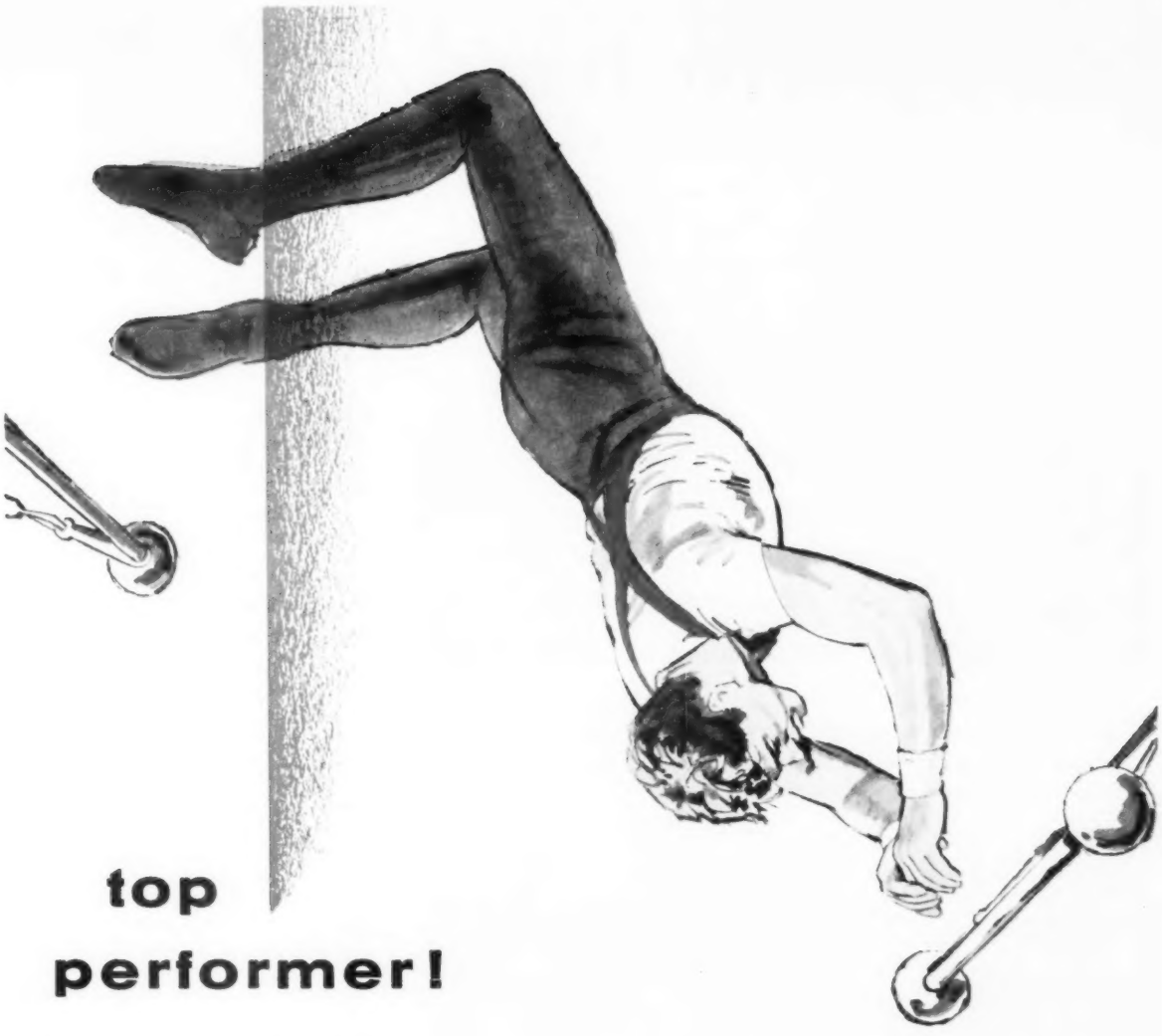
• Sequence of operation

In the case of a standing pilot dryer control system, the sequence of operation begins when the pilot is first lighted. As covered previously, the button on the pilot must be held down during the lighting, allowing the mechanical valve to pass gas to the pilot. This gas is then ignited by a match. Possibly a runner tube is used, wherein the gas is actually lighted at the runner tube, and this in turn lights the pilot. When the pilot is sufficiently hot to mechanically lock the pilot valve mechanism in the open position, the button can be released. This differs from an electric ignition system, in that the pilot valve is operated through an electric switch, whereas this is a completely mechanical system. It is usually recommended by dryer manufacturers that the pilot be allowed to always remain lighted. In some cases, however, the housewife will see fit to light the pilot only on those days that she is doing the family laundry.

After the pilot is lighted, or if it remains lighted from a previous drying cycle, the housewife chooses the necessary thermostat adjustment, as in the case of the electric ignition system, and also sets the timer. The main burner valve opens immediately, and the drying cycle begins. Here again, the length of the drying cycle is determined by the timer, with the temperature in the drum controlled by the operating thermostat. At the end of the cycle, the main burner is extinguished, and the drum and fan are de-energized. The pilot, however, will remain lighted for the next cycle, or continuously, as the choice may be.

If for some reason during the drying cycle the pilot is extinguished, the mechanical valve will close, and shut off gas not only to the main burner, but to the pilot as well. It will then be necessary to reignite the pilot manually. ■

Next month: What the gas serviceman should know about oven controls



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GAS · ASSOCIATIONS

Purdy succeeds Darroch in Canadian association

Dr. Henry L. Purdy, executive vice president of B. C. Electric Co., Ltd., is the newly elected president of the Canadian Gas Association. He was chosen to succeed H. C. Darroch during the association's 51st annual meeting held in Murray Bay, Quebec, recently.

Other newly elected officers are: 1st vice president, N. E. Tanner, chairman of Trans-Canada Pipe Lines Ltd., Toronto; 2nd vice president, R. C. McPherson, senior vice president of Canadian Western Natural Gas Co., Ltd., Calgary.

CGA's Purdy

Directors include: W. H. Dalton, also managing director of the association, Toronto; D. Cass-Beggs, T. E. Cross, K. Lucas, J. R. Reeves, G. M. Douglas, John Hobbs, H. C. Darroch, G. E. Downie, J. W. Ostler, C. R. Hetherington, E. H. Rohrer, and Bruce Willson.

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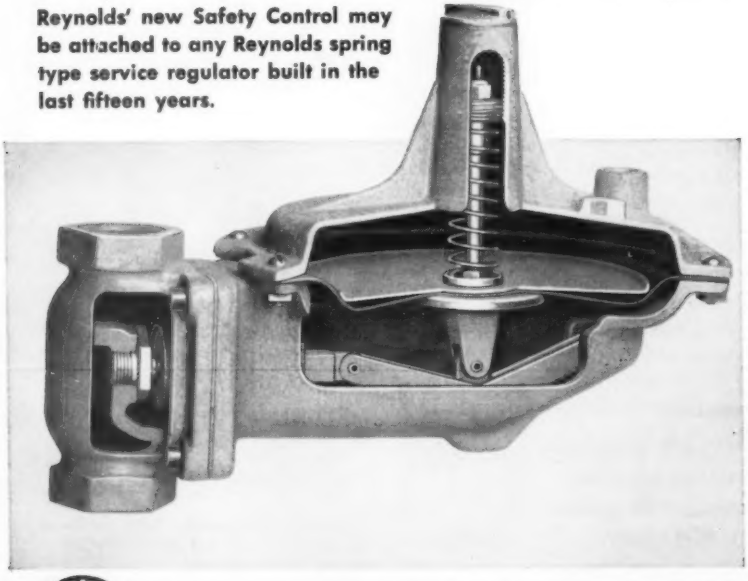
Reynolds' new Safety Control may be attached to any Reynolds spring type service regulator built in the last fifteen years.



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Robert Smith assumes AGA research post

Robert B. Smith, formerly coordinator of research for the Columbia Gas System Service Corp., has joined the AGA as assistant director of research.

For the past year, Mr. Smith has been on temporary assignment to the association, during which time he has administered the association's PAR air conditioning research program and has served as liaison with present and potential manufacturers of gas-fueled air conditioning equipment.

In his new capacity, Mr. Smith will work with T. L. Robey, AGA's director of research. His activities will cover the entire scope of the association's research program, but his direct responsibility will remain in the field of gas air conditioning.

Michigan gasmen choose Leonard Perry

Michigan gasmen elected Leonard L. Perry as president of their association for the coming year. Mr. Perry is vice president and general manager of Michigan Gas & Electric Co.

J. B. Simpson, a vice president of Consumers Power Co., Jackson, was named vice president of the Michigan Gas Association. Elected to his fifth term as secretary was Milton G. Kendrick, administrative assistant to the vice president in charge of sales of Michigan Consolidated Gas Co., Detroit.

Arthur Crawley, Flint division

Leonard Perry

manager of Consumers Power, was elected to the board. Outgoing president George E. Ludwig, Muskegon district manager of Michigan Consolidated, became ex-officio member of the board.

C. M. Swan new president of Pennsylvania gasmen

New president of the Pennsylvania Gas Association is C. M. Swan, president of Pennsylvania Gas Management Co., Tamaqua, Pa. He was elected at the group's annual meeting held recently in Pocono Manor.

Other officers elected are: 1st vice president, W. C. Pierson, general superintendent of gas operations, Philadelphia (Pa.) Electric Co.; 2nd vice president, E. H. Smoker, president, United Gas Improvement Co., Philadelphia; 3rd vice president, L. B. Richards, vice president, United Gas Improvement, Harrisburg; secretary and treasurer, J. A. Schultz, division accounting manager, UGI, Reading.

New officers of the Pennsylvania Gas Association are (front row, left to right): W. C. Pierson, C. M. Swan, E. H. Smoker. Back row, from left: Frank H. Lichtenwalter (managing director), L. B. Richards, and J. A. Schultz.

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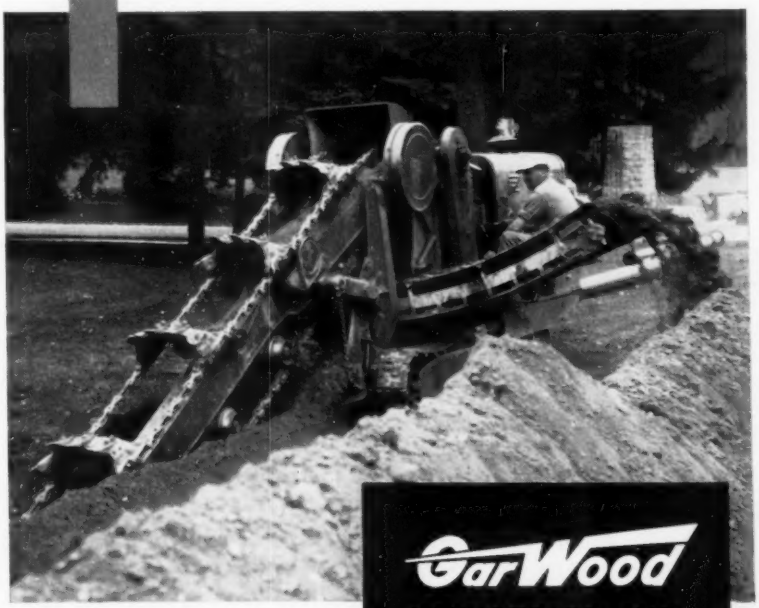

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associations • *Continued*

New members of the governing council serving three-year terms are Henry S. Davis, division manager, Philadelphia Electric, Jenkintown; Julius Klein, president, Caloric Appliance Corp., Topton; H. L. Robbins, director of services, Philadelphia Gas; and H. A. Vicker, vice president, Scranton-Spring Brook Water Service Co., Scranton. Elected to a one-year term was John E. Geesey, president, York County Gas Co.

This year's convention marked the 50th anniversary of the Pennsylvania Gas Association.

Association Notes

New officers were elected at the annual management conference of the Florida-Georgia Gas Association held recently in Miami.

Chairman of the group for the coming year is Walter T. Napier, Jacksonville Gas Corp., Jacksonville, Fla. Secretary-treasurer is L. A. Friederich, Peoples Gas System, Tampa.

Newly elected officers of the Public Utilities Advertising Association are: president, George W. Kindon, Philadelphia Electric; 1st vice president, Warren Widenhofer, Indiana & Michigan Electric Co.; 2nd vice president, Frank C. Lietz, Northern Illinois Gas Co.; 3rd vice president, Jack A. Fleming, Canadian Western Natural Gas Co. and Northwestern Utilities; secretary, Robert H. Robertson, Florida Power Corp.; and treasurer, Mead Schenck, Interstate Power Co. (reelected).

Correction

In our July issue, in the article "Peak shaving with LPG," by James K. Dawson, mechanical engineer, The Peoples Gas Light & Coke Co., Chicago, GAS incorrectly stated that J. F. Pritchard & Co., Kansas City, Mo., designed the plant facilities at Calumet and Crawford stations that were installed last year.

Actually, Pritchard & Co. furnished and installed 40 LPG tanks at each of Peoples' Calumet and Crawford stations in accordance with drawings and specifications of The Peoples Gas Light & Coke Co.

GAS apologizes to The Peoples Gas Light & Coke Co. and J. F. Pritchard & Co. for this mistake.

GAS CALENDAR

August

25-27. Appalachian Gas Measurement Short Course—University of West Virginia, Morgantown, W. Va.

September

3- 5. Pacific Coast Gas Association Annual Convention—Multnomah and Benson Hotels, Portland, Oregon.

5. New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

11. New England Gas Association Safety Conference — Sheraton Plaza, Boston.

12. New England Gas Association Commercial-Industrial Heating Division — Wachusett Country Club, West Boylston, Mass.

15-16. INGAA Annual Membership—The Roosevelt Hotel, New Orleans.

16-17. AGA 10th Annual Accident Prevention Conference — Sheraton-Seelbach Hotel, Louisville, Ky.

17-19. Southeastern Gas Association Annual Meeting—Sir Walter Hotel, Raleigh, N. C.

19. Oklahoma Utilities Association Gas Division Conference—Biltmore Hotel, Oklahoma City.

24-27. 7th International Gas Conference—Rome, Italy.

October

9-10. California Natural Gasoline Association 33rd Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena, Calif.

13-15. American Gas Association Annual Convention—Atlantic City, N. J.

15-17. Wisconsin Utilities Association Electric & Gas Sales Operating Convention — Hotel Schroeder, Milwaukee.

20-24. National Safety Council—Chicago.

30. New England Gas Association Operating Division — Sheraton-Kimball, Springfield, Mass.

31. New England Gas Association Accounting Division—Statler Hilton Hotel, Hartford, Conn.

November

19-21. Mid-West Gas Association Gas Meter & Service School and Conference — Iowa State College, Ames.

December

16. Rocky Mountain Gas Association Annual Meeting—Denver, Colo.

Pat. Applied For

RIDGID Hex Wrench

gives you Time-Saving, Positive, 4-Sided Grip on Hex Nuts, Square Nuts, Valve Packing Nuts, Unions, Gas Cocks

Here's the adjustable wrench you've always needed for hexes, squares and flatheads, rough or finished. Extra useful on every job. No more barked knuckles or rounded nut shoulders. New wide-open jaw goes on easy . . . won't slip off. 4-sided grip gives extra leverage. Stays to adjusted size during use.

Available in 3 Sizes

No. 11, 3/8" to 3/4"—No. 17, 5/8" to 1 1/4"—No. 25, 1" to 2"

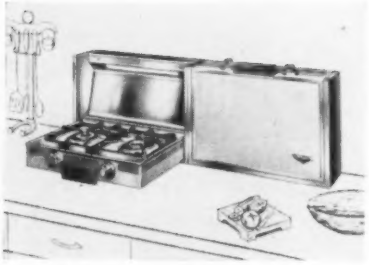
Famous RIDGID heavy-duty construction with guaranteed housing. Narrow jaw design makes work easy in tight places even on thin nuts. Comfort-grip I-beam handle has handy hang-up hole. The new RIDGID Hex Wrench gives you more for your money than wrenches costing twice as much. Try it, buy it at your Wholesaler's.

The Ridge Tool Company • • Elyria, Ohio, U.S.A.

GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 87, 88



1. Foldaway cooking top

Dixie Products' Foldaway is a two-burner built-in counter-top cooking unit that folds into its own slim, square-cornered cabinet when not in use. The Foldaway puts four burners in less than 2 ft of counter-space. The units may be used singly or in pairs in any number of convenient ways.
Dixie Products Inc.

2. Prefabricated station

A compact, fully enclosed district regulator station is available from Tuloma. The station can be installed by simple inlet and outlet connections to existing mains at any convenient location. Design permits use of a wide range of regulators, relief valves, and pressure gauges. One lock safeguards all controls.
Tuloma Specialties

3. Pipe outerwrap

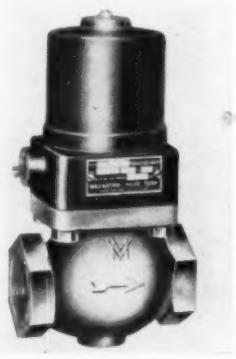
High tensile strength for high speed application and low initial installation costs are two of the features claimed for Carey-Glass outerwrap. Composed of reinforced glass mat saturated and coated with a specially developed long life bitumen, Carey-Glass outerwrap is specifically designed to protect pipeline coatings from mechanical damage during handling and lowering-in operations.
Philip Carey Mfg. Co.

4. Ditch padding machine

The CRC ditch padding machine is adaptable to any standard ¾-cu yd dragline. The machine consists of an endless steel wire grid, 6 ft wide, rotating on a shaker track system which loosens dirt from rocks in the spoil. Fine dirt is shaken through the grid and onto the pipe, while all rocks larger than the grid openings are conveyed across to the working side of the ditch.
Crutcher-Rolfs-Cummings Inc.

5. Transmitter-receiver

RCA's new 24-channel microwave radio station for point-to-point communications can be installed indoors or mounted on a pole. The MM-9E operates with a minimum of interference from atmospheric conditions, permitting uninterrupted remote control of a pipeline system from a central point, with no threat of broken wire circuits in ice or snow storms.
Radio Corp. of America



6. Hum-free valve

Type T full-port, normally closed valve from Magnatrol has been designed for applications that demand hum-free vibrationless operation. According to the company, excellent results can be obtained with the solenoid valves in the automatic remote control of gases and liquids where the transmission of vibrations are a source of annoyance or cannot be tolerated.
Magnatrol Valve Corp.

7. Gas furnace

GE's new "custom" gas furnace for the residential market is designed outwardly to complement the latest trends in home appliances while at the same time sporting completely new engineering achievements in a redesigned heat-

ing element. A steel heat exchanger is incorporated permitting it to be a good contender for the competitive builder business.
General Electric Co.

8. Side boom

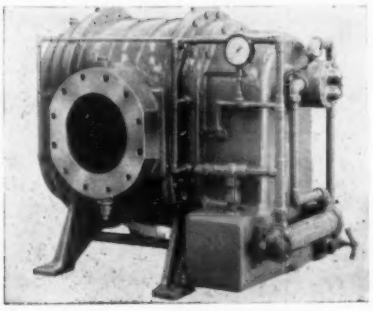
The Sooner Boomer industrial type wheel tractor is an all-hydraulic conventional combination side boom, incorporating an angle dozer and a rear winch. Hydraulic counterweights serve as a stabilizer. The machine is rigged to bend pipe up through 8 in. in diameter. A travel speed of up to 27 miles/hr makes possible many time and money saving advantages.
Sooner Boomer

9. Circular slide rule

General Industrial's circular slide rule is for those who must perform simple calculations. Operation of the rule is simple and the results are accurate. To multiply, divide and find proportions is easy and fast.
General Industrial Co.

10. Commercial water heater

Literature and specifications on the B-97 Burkay commercial water heater are available. The storage and circulating tank water heater has an input of 97,000 Btu/hr and a 70-gal. storage capacity with an 81.5 gal./hr recovery at 100° temperature rise.
A. O. Smith Corp.



11. Blower

A completely new blower, using the basic Roots rotary positive principle, introduces major design and operating advantages for more efficient handling of gas and air. The Type RAS blower features a vertical arrangement of impellers providing horizontal inlet and discharge connections and savings of up to 40 per cent in floor space.
Roots-Connersville Blower

12. Telescopic hoist

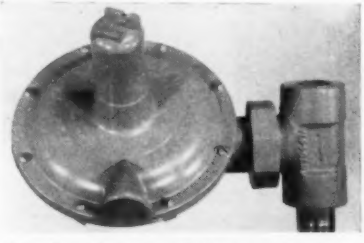
Gar Wood's new line of twin cylinder underbody telescopic hoists has capacities ranging from 6½ to 8 tons. The hoists feature short stroke design, with only one moving sleeve section. Lightweight design results in greater payloads and lower gasoline consumption.
Gar Wood Industries Inc.

13. Drafting pencil

A new kind of drafting pencil, called Duralar, is especially for use on Mylar matte-surface tracing film. The pencil has a plastic, rather than a graphite, base. Drawings made on Mylar with the new pencil can't smear or smudge under handling. They erase completely and cleanly and, according to the manufacturer, reproduce as sharp as India Ink originals. *J. S. Staedtler Inc.*

14. Clothers dryers

Two new automatic gas clothes dryers from Roper offer totally new, extra-gentle action combined with fast, thorough drying. The satin-bronze drying tub is polished throughout to prevent snagging. Smooth baffles tumble clothes in the Zephyr-Air current. The moisture-laden air is removed through Roper's Tornado exhaust. On the Custom Deluxe model, five-heat temperature control is provided.
Geo. D. Roper Corp.



15. Service regulator vent

Rockwell's "143" service regulator is now available with a side vent. The new design provides a choice between a "143" regulator with direct upward or downward venting or side venting—whichever is more practical. Available with die-cast aluminum upper and lower diaphragm cases, the regulator combines light weight with the advantages of 360° swivel design.
Rockwell Manufacturing Co.

16. Sealing compound

Marseal is a new pipe and joint sealing compound which is insol-

uble in most liquids and gases. The viscous adhesive compound does not solidify, but expands and contracts with metal. A brush-top applicator facilitates sealing of tanks, gas cylinders, compressors, pumps, valves, etc.
Margate Manufacturing Co.

17. Computer

Burroughs' Series F2000 computer features simple operation and a high degree of reliability, along with low original and maintenance costs. The new computer has Burroughs mechanical plug-board program selector. Up to 19 memory units may be used for data storage of varying factors or totals.
Burroughs Corp.

18. Pressure regulator

In Maxitrol's new gas appliance pressure regulator, the outlet pressure tap is located on top of the regulator. Model RV-31 features a new low stack concept. The outlet pressure tap and smaller dimensions make this regulator ideal for water heaters. Its design also applies to other gas appliances with limited mounting areas.
Maxitrol Co.

19. Flame-set control

Robertshaw's redesigned top burner thermostatic control offers adjustable settings for maximum size flame as well as for temperature. The flame height adjustment insures excellent cooking results regardless of material, shape or size of cooking utensil. The new control with the Flame Set feature conserves fuel by directing it only at the bottom of the cooking utensil.
Robertshaw-Fulton Controls Co.

20. Oxygen re-breather

A 1-lb oxygen re-breather that provides safe protection for a person entering gas-filled areas and aids resuscitation in emergencies has been introduced by the Palmer Co. The Dalanator uses thumb-sized cartridges of oxygen discharged, as needed, into an accordion-pleated breather bag attached to the mask assembly.
Palmer Co.

21. Telemetering transceivers

SIE's TTR-series telemetering transceivers are designed for transmission and reception of digital information over telephone lines, radio, or microwave links. TTR master and TTR-A slave units are used for remote control and central data gathering in gas and oil lease production, and for the control and monitoring of pumping, compressing, and switching operations.
Southwestern Industrial

TRADE LITERATURE

22. Odorizing natural gas

A two-page bulletin from Hills-McCanna features the use of the McCannameter—a packless proportioning pump—as the heart of odorizing systems. Typical requirements of an odorant pump are listed and schematics for integrated systems are shown.
Hills-McCanna Co.

23. Pipe chart

Essential pipe specification information such as wall thickness, weight, and OD of seamless and welded steel pipe under ASA schedules from ⅛ in. to 24 in. are presented in a wall chart from Midcontinent Tube Service.
Midcontinent Tube Service

24. Gas engines

Three models of Ingersoll-Rand's new line of 4-cycle, V-angle gas engines are discussed in a series of new fliers. The machines are said to be rugged and compact and are built for dependable continuous service at partial or full loads and speeds.
Ingersoll-Rand Co.

25. Planetary gear operator

Advantages of Rockwell's new planetary gear operator—for use with Rockwell-Nordstrom Hypreseal wrench-operated valves handling high pressures—are described in a four-page, illustrated bulletin. Operator selection guide and installation directions are included.
Rockwell Manufacturing Co.

26. Two-way radio

General Electric's new portable two-way radio with completely transistorized receiver is discussed in Bulletin ECR 566A. Sensitivity, receiver design, audibility, standby drain and field servicing are covered. Application photos highlight the bulletin.
General Electric

27. Packaged compressors

Stearns-Rodger's packaged compressor plants are described and illustrated in a new colorful brochure. Also discussed are the engineered components.
Stearns-Rodger Mfg. Co.

28. Dehydration unit

Dewpoints of —150°F and 5-micron filtration of air, gas or liquids are possible with a new dehydration unit from Dehydrators Inc. The new line of dehydrators—ranging in size from 2 in. to 8 in. in diameter—is discussed in a four-page illustrated catalog.
Dehydrators Inc.

29. Pressure seal gasket

A new pressure-seal cone gasket has been introduced by Adams Pipe Repair Products. Descriptive literature is available on the gasket, usable with any pipe clamp.
Adams Pipe Repair Products

FOR MORE INFORMATION

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GAS · DISTRIBUTION NEWS

New Jersey Natural ups '58 budget $1 million

Accelerated growth in Monmouth and Ocean counties, N. J. is raising the 1958 construction budget of New Jersey Natural Gas Co. by $1 million.

Dale B. Otto, president of the Asbury Park, N. J. utility, said that the additional money is to take care of the residential and industry development that "we can foresee for several years." He added the money will be used not only to extend the company's mains, but also to reinforce its existing distribution system.

One half of the $1 million will go for extension of the new 8-in. transmission line covering 26 miles from Browntown to Laurelton. The addition will run 13 miles from Laurelton to Toms River.

Another $150,000 will go toward reinforcing existing mains in the Raritan Township - Middletown Township area, which has experienced the greatest growth in the past decade. Mr. Otto stressed that "Here again, our existing facilities are more than adequate to handle the current load, but we feel there will be no abatement in the building of the Bayshore area and we are building for several years hence."

For extreme sensitivity

Spring Loaded Appliance Regulator. Model 5500M

Norwalk

PRESSURE BALANCED REGULATORS give close control

Norwalk's complete line of custom built commercial and industrial appliance and service regulators are extremely sensitive and give close control over wide ranges of gas flow. Spring loaded and dead weight models for inlet pressures up to 100 psi and outlet pressures as low as 3" W C in pipe sizes from ½" to 24".

Norwalk Regulators are custom designed and individually tested to meet special as well as standard needs. They provide the safety and low maintenance costs that have made Norwalk Valves famous for long life and dependability for 80 years.

For positive control of gas and air— *Call Norwalk.*

INDUSTRY'S COMPLETE LINE

Check Valves Pipe Sizes ⅜" to 42". Screwed end Models to 4".

Manometers Pressure or Vacuum.

Pressure Controllers Pressures to 5 psi.

Appliance Regulators Pipe Sizes ½" to 2".

Station Regulators Pipe Sizes 3" to 24". Liquid Seal or Diaphragm Types.

Relief Valves Pipe Sizes ½" to 24".

Filters Pipe Sizes ½" and up.

Complete Engineering Cooperation

NORWALK VALVE CO.

Established 1878

SOUTH NORWALK, CONN.

Boston • Chicago • Cleveland • Detroit • Los Angeles
Minneapolis • New York • Philadelphia • Pittsburgh
San Francisco • Washington, D.C.

LILCO quits appliance merchandising

On July 1, Long Island Lighting Co., Mineola, quit the retail merchandising of appliances.

In making the announcement LILCO's vice president in charge of gas and electric sales, Wilmot O. Smith, said that "concurrently with the tremendous growth of population and business and industry development has come the local shopping area and shopping centers. Where a few years ago LILCO's business and service offices were among the very few gas and electric retail appliance outlets, now there are modern, well-lit showrooms in practically every community throughout Long Island. These are run by progressive, well-informed dealers," he said. "LILCO is going out of the retail selling of appliances in favor of the local merchant who is well qualified to give the consumer what he wants."

"We will continue to make free heating surveys," Mr. Smith said, "prepare cost estimates on gas heat and cooperate in every way with . . . appliance dealers . . . so that our consumers may enjoy the full benefit of modern, efficient appliances."

"We at LILCO feel now is the time to help stimulate Long Island's business. Turning our retail sales operations over to local dealers . . . will aid in giving an upward impetus to the prosperity of Long Island. We are making this point in our advertising," he concluded.

Rented barricades save money for Lynn Gas

Lynn (Mass.) Gas & Electric Co. figures it is saving money by renting, rather than buying, barricades for construction jobs.

Until recently, the company used

conventional sawhorse barricades with lanterns. One man was kept busy full time seeing that the lanterns were supplied with fuel. It was a seven-day-a-week job. Furthermore, pilferage was high—as many as 200 lanterns disappeared from the job every year.

Today, Welsbach barricades of metal construction, on which are mounted (firmly) flashing lights, are used on a rental basis. Pilferage has been eliminated, as has servicing. The batteries which operate the lights have a 45-day life, and they are serviced by the company which owns them.

Stocks of barricades are kept on hand at the gas company, but the rental fee is charged only on days when they are in use. The 40-cents-per-day fee represents a big saving, according to Lynn Gas officials.

The lights are, of course, explosion-proofed.

Allied Chemical Corp. reorganizes divisions

Allied Chemical Co., New York, is creating two separate divisions to manufacture and market product lines now handled by its present Barrett Division.

Barrett's long-established line of roofing, building and paving materials will be separated from the plastics and coal chemicals and will continue to be manufactured and sold under the Barrett name. H. Dorn Stewart will be appointed president of the division.

The manufacture and sale of plastics, resins and industrial chemicals will be conducted by the Plastics & Coal Chemicals Division. T. J. Kinsell, a head of Barrett since 1952, will be president of that division.

digs them all, big or small, services...extensions...mains

This Cleveland "95" is cutting clean, wide trench in loose dirt and gravel for a new gas main in western Michigan. You can see how easily its discharge conveyor is handling the big volume of spoil from the spudded trench and placing it precisely where wanted for quick and easy backfilling.

The "95" works just as efficiently on small extensions and service lines, too. Highly maneuverable and compact (only 4′9½″ across the crawlers) for digging in crowded quarters, its shiftable, reversible conveyor lets it dig right by poles, trees, hydrants, etc.

This usability plus proven reliability over a long life makes your distribution budget dollars go farther with a Cleveland.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed

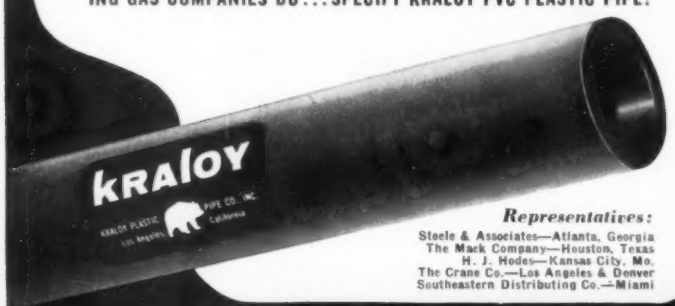
Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO...SPECIFY KRALOY PVC PLASTIC PIPE!



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The Crane Co.—Los Angeles & Denver
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Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*
4720 East Washington Boulevard, Los Angeles, California
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. Subsidiary

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PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN USED SINCE 1897 GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

Gas to light airport runways in Little Rock

The first airport gas lighting system in the U. S. will be installed at the North Little Rock municipal airport by the Arkansas Louisiana Gas Co. with approval of the Civil Aeronautics Administration and the North Little Rock Airport Commission.

Noble Air Service, holder of the contract for operating the city-owned airport, said the runways will be lighted with 50 perpetually burning gas lights 18 to 20 in. above the ground. Cost of operation will be much lower than electric lights.

Noble said the CAA has recommended similar installations at other airports, including that at Oklahoma City.

Residential gas survey available from AGA

AGA's bureau of statistics has published its "Survey of Residential Gas Service by Counties."

This detailed publication provides for each county in the U.S. the name of the gas company providing service, characteristics of the gas distributed (including Btu value, specific gravity and pressure at consumer's meter), number of residential gas customers, estimated total families served by gas, and approximate saturations of gas ranges, water heaters, dryers, and heating equipment. Included also is a map showing which counties have utility gas service.

Lone Star honors district managers

Lone Star Gas Co. climaxed its first annual management achievement awards competition by honoring 12 district managers in the company's general division of distribution for outstanding managerial work.

Because of the broad scope of assignments for which Lone Star district managers are accountable, the program was designed by the company to enable the managers to divide their attention among various aspects of management in proportion to the relative importance of each. The awards were determined by the scoring record of the district over which the manager had supervision for a period

of seven months or more during 1957.

Five objectives were used as the basis for scoring: lowered operating costs, increased control of gas leakage, improved gas and merchandise collections, increased merchandise sales, and increased merchandise net revenues. In Oklahoma, promotional activity was measured by purchase of dealer contracts.

First, second and third place awards were presented to managers of Class A, B and C distribution district offices in Texas and to managers of Oklahoma region districts.

For Class A district, winners were Floyd W. Harris of Garland (1st place), George A. Gott Jr. of Waco (2nd), and William M. Braymer of Abilene (3rd).

In Class B districts, Byron A. Mitchell of Denison won 1st place, Logan D. Wilson of Lancaster took 2nd and Roy E. Day of Taylor 3rd.

Roy J. Porter of Colorado City won 1st place in Class C Districts. He was followed by Jasper L. McCaleb of Athens and Joe Lambert Jr. of Kerrville.

In the Oklahoma region, George Juett Jr. of Idabel won first place. He was followed by Basil G. Johnson of Waters and James H. Hodges of Pauls Valley.

13 Saskatchewan towns getting gas in 1958

Including distribution systems now under construction, some 13 Saskatchewan cities and towns will be added to Saskatchewan Power Corp.'s distribution network before the coming winter heating season.

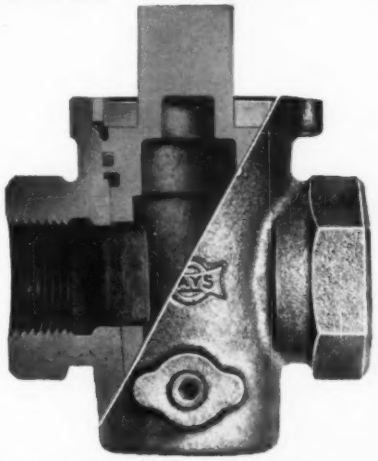
Centers added and under way are Domremy, Prud'homme, Kinley, Springwater, Weyburn, Estevan, Maple Creek, Lampman, Mortlach, Parkbeg, Success, Dodsland, and Plenty.

Western research center opened by Robertshaw

Doing its part to make true the forecast that American homes will change more in the next 30 years than they have in the last 300, is Robertshaw-Fulton Controls Co.'s new research and development center in Anaheim, Calif.

Thomas H. Jeffers, general manager of the Western Research Center, said the new facility will be used to develop systems and automatic controls for air conditioning, space heating, water heating, refrigeration, food preparation and

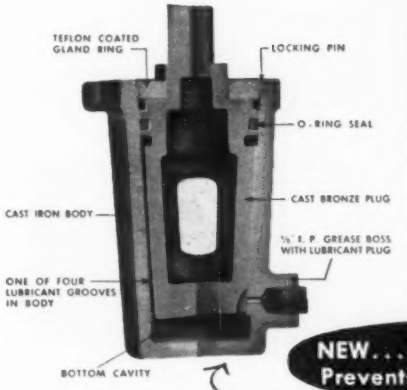
THIS GAS STOP WILL NOT STICK...



- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
- O-Ring prevents top leakage . . .
- Teflon Coated Gland Ring reduces friction between top of plug and gland ring...

Re-Lubrication does the TRICK

HAYS LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
- Individually tested . . .
- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

NEW... Solid Bottom Construction Prevents Leakage and Tampering

HAYS®

GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

ERIE, PA.

preservation, laundering and other major home appliances.

Lone Star Steel's Joe Roughneck honored

"Joe Roughneck," the fictitious character around which Lone Star Steel Co. has built its public relations-customers relations program, was honored during the recent annual meeting of the American Iron & Steel Institute.

New half million dollar research and development center opened in Anaheim, Calif., recently by Robertshaw. Part of the research installation at the right is a completely equipped and furnished home which will be used for testing home appliances and automatic controls in actual living conditions.

The institute, composed of more than 250 iron and steel companies, selected the symbolic character of Joe Roughneck to appear as guest "spokesman" before the meeting's general assembly.

L. D. "Red" Webster, vice president in charge of public relations and advertising for the Dallas-based pipe company, presented the commentary accompanying 22 colored slides depicting the Roughneck activities which have made the two-dimensional character not only the steel company's star "salesman," but an accepted personification of the petroleum business.

Arkla speeds production

Production at the Arkla Air Conditioning Plant in Evansville, Ind. has been stepped up to three shifts per day, six days per week, in order to meet increasing demand for the Sun Valley all-year gas air conditioning units, according to President W. R. Stephens. Production is now at the rate of 10,000 units per year.

General sales offices for Arkla are now permanently located in Little Rock.

Union Gas still growing

Union Gas Co. of Canada Ltd., Chatham, Ont., estimates that by the end of the current fiscal year (Mar. 31, 1959), the company and its subsidiaries will be supplying gas to some 210,000 customers.

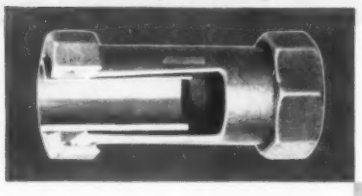
At least seven new markets will be added during that time. Exten-

NORMAC

Couplings, Sleeves and Fittings

For UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.



NORMAC COUPLINGS

Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.

COMPRESSION-END "ELLS"

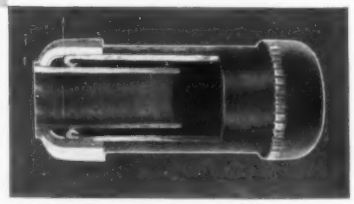
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"

Full coupling depth. Special threads on male end prevent dropping into old hand taps.

NORMAC #50-A STEEL COUPLINGS

Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1¼" inclusive. 10" and special length centers available.



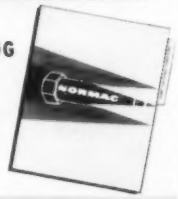
Normac also manufactures a complete line of red brass fittings in O. D. sizes: ⅜", ½", ¾", 1¼", 1½" — and a complete line of insulated couplings and fittings.

NORTON-McMURRAY Manufacturing Co.

919 North Michigan Avenue, Chicago 11, Illinois

New CATALOG

Write for your copy . . . it gives complete details and specifications of NORMAC equipment.



Couplings • Sleeves • Compression End Cocks • Brass Compression Fittings • Service Tees and Ells

sion of distribution facilities in existing markets and building an additional 80 miles of transmission line are included in Union's plans.

SAS • News Notes

The long-awaited standard purchase specifications for small gas meters of the diaphragm type have been approved by the board of directors of the American Gas Association and are now available as OP-58-2, according to James Webb, chairman of the task committee on meter standardization.

Odie E. Walker, vice president of the Mueller Co., Decatur, Ill., has been named advisor to the director of the water and sewerage industry and utilities division of the U. S. Commerce Department's Business and Defense Services Administration. Mr. Walker will serve without compensation on loan from his company for about six months.

Buflovak Equipment Division of Blaw-Knox Co. has appointed Johnston Engineering Sales Co., Wayland, Mass., as its representative in Maine, New Hampshire, Vermont, Massachusetts, and the northeastern part of New York.

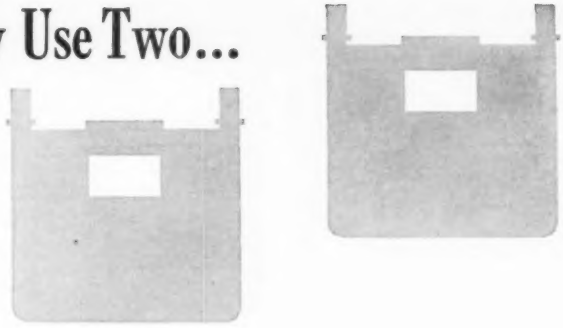
J. C. Templeton, vice president of Arkansas-Louisiana Gas Co., Shreveport, will present the principal address at the Appalachian gas measurement short course scheduled for Aug. 25-27 at West Virginia University in Morgantown. Purpose of the course is to provide information on application, operation, and repair of natural gas quantity measurement and pressure regulation equipment.

Pennsylvania's Public Utility Commission has okayed Scranton-Spring Brook Water Service Co.'s purchase of Berwick (Pa.) Gas Co. Selling price is $116,980.

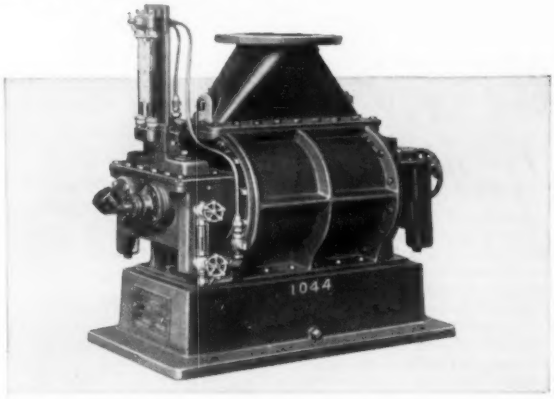
Sixty men representing 25 gas utilities attended Fisher Governor Co.'s annual spring gas regulator conference held recently in Marshalltown, Iowa. Classes covering design, production, installation, and maintenance of gas regulators—conducted by Fisher sales and engineering personnel — highlighted the conference.

Piedmont Natural Gas Co., Charlotte, N. C. has placed a $3.5 million issue of first mortgage bonds

Why Use Two...



When One Will Do...



Better!

When *one* Roots-Connersville rotary gas meter is used in place of *two* . . . or *three* . . . or *four* of other types, metering costs go down.

This fact has been proved by utility companies and commercial and industrial users of gas everywhere as shown in this typical comparison:

Comparative Analysis	SPACE OCCUPIED	TOTAL CAPACITY	METER COST	INSTALLING COST	TOTAL COST
FOUR DIAPHRAGM METERS	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ONE RC METER	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

First cost is substantially reduced with the proper selection of the *one* Roots-Connersville meter, from the 39 sizes offered, for a specific requirement. Further savings are made in foundation, piping and installing costs, and in space.

But this is only part of the story. Roots-Connersville gas meters assure unalterable accuracy with far less maintenance than required by other types. There are no valves, valve gear or other small parts to wear out and cause inaccuracies. Servicing is limited to lubrication of bearings and gears and an occasional check of the operating differential.

For additional data, please refer to our section in **Chemical Engineering Catalog** or **Mechanical Catalog** or write for descriptive Bulletin M-152.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

858 Oregon Avenue, Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto, Ont.

WELSBACH
"SAFE-GARD" GAS STOP
TAMPER-PROOF EASY RE-LUBRICATION DURABLE

Lock Wing "Safe-Gard" Gas Stop... Cast Iron Body, Bronze Plug with Lubricant Channels. Flat Head Type, Catalog No. G 551... 125 p.s.i. max. pressure... Sizes ¾" to 2". Tamper-proof design is so simple, yet so positive and far superior to anything else on the market. The key cannot be removed or blown out, even if broken in two at the gasway by unauthorized personnel. Grease plug is at top of valve for utmost relubrication convenience. "Safe-Gard" feature: the holding screw is permanently concealed from view, in fact, only microscopic examination reveals evidence of this camouflaged recess in the casting... see for yourself by asking for your copy of the WELSBACH-Kitson Catalog.

No. G 453

HIGH PRESSURE GAS VALVE
EASE OF OPERATION, NO EXPOSED NUTS OR BOLTS, BRONZE TO BRONZE, NO LUBRICATION REQUIRED

Tamper-proof High Pressure Gas Valve, metal to metal seating, max. pressure 200 p.s.i. 1" Inlet and Outlet, inside iron pipe thread. These valves have no exposed bolts or nuts. When the valve is in full open position, the upper bronze to bronze back seat eliminates all surface line pressure on the packing. Superior design and individual inspection insures against gas leakage or binding... there are truly no better, if as good, valves than those by WELSBACH-Kitson! Write for the detailed Catalog.

The name WELSBACH has stood for Quality and Dependability for more than 80 years.

WELSBACH

THE WELSBACH CORPORATION
WESTMORELAND & STOKLEY
PHILADELPHIA 29, PENNA.
Kitson Valve Division

news • *Continued*

with five institutional investors. Proceeds will help increase facilities to distribute gas to more customers. Principal cities served by Piedmont include Charlotte, Winston-Salem, Greensboro and High Point in North Carolina, and Greenville and Spartansburg in South Carolina.

Robertshaw-Fulton Controls Co.'s Grayson Controls division in Long Beach Calif., has been picked by the American Association of Nurserymen as one of the top 10 industrial plants in the nation. The 1958 Plant America award was presented "in recognition of the achievement and beautification contributing to employee and civic pride in our American heritage."

Caloric Appliance Corp.'s plant has begun production of sinks color-coordinated with Caloric built-in ranges. Sinks and built-in gas ranges are available in pastel shades of yellow, blue, green, and pink, plus coppertone, black and white to match, contrast, or blend with any kitchen color scheme.

Hills-McCanna Co., Chicago, has appointed Engineered Instrument Sales Co., Memphis, Tenn. as exclusive representative. The company will serve western Tennessee, northern Mississippi and all of Arkansas.

Wedgewood-Holly Appliance Co. is the new name of the sales company of the Wedgewood - Holly Corp. The corporation, a wholly owned subsidiary of Rheem Manufacturing Co., changed its name from Standard Enameling Co. in April. The change of name in the sales company brings about a consolidation of Western-Holly Appliance Co. and Wedgewood Appliance Co.

Sinclair Oil & Gas Co., Tulsa, has launched a new trade name, emblem, and advertising program for its LPG. The trade name, Truflame, and the new emblem were selected, along with the advertising program, because of the growing demand among consumers for brand identification. In its advertising program, Sinclair is offering advertising assistance to its distributors in newspapers, radio, direct mail, and roadside signs.

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY
Incorporated
3164 S. CALIFORNIA AVE.
CHICAGO 8, ILLINOIS
Elizabeth, New Jersey

GAS · PEOPLE

ED PARKES, executive vice president since 1955, has been elected president of United Gas Corp., Shreveport. M. C. MCGOWEN, president since 1944, will continue as chairman of the board. Mr. Parkes, who has been with the United Gas system for more than 30 years, also has been serving as a director of United Gas Corp. and president of its two subsidiaries, United Gas Pipe Line Co. and Union Producing Co. Other posts held by Mr. Parkes include assistant superintendent, district superintendent, assistant general superintendent. In 1937 he was named general superintendent of field pipelines.

Ed Parkes
United Gas

William Waterman
Iowa-Illinois

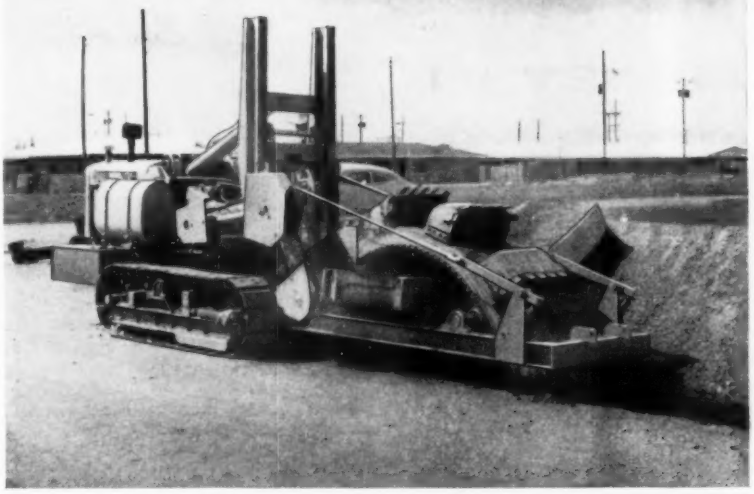
WILLIAM W. WATERMAN has been elected vice president and general counsel of Iowa-Illinois Gas & Electric Co., Davenport. Mr. Waterman joined Iowa-Illinois in 1952 as assistant general counsel. In 1954 he became general counsel. Since October 1952 Mr. Waterman has been a member of the company's management advisory board.

ROBERT W. RAMSDELL, president of East Ohio Gas Co., Cleveland, has been elected a director of Consolidated Natural Gas Co., New York. He succeeds WILLIAM G. ROGERS, who is retiring. Mr. Rogers has served as chairman of the board and past president of East Ohio. A director of East Ohio for

Robert Ramsdell
East Ohio

William Rogers
East Ohio

PARSONS® 170 *wide-wheel* TRENCHLINER®



TRENCH WIDTHS: 20 TO 32 INCHES

Developed to meet the demand for wide work range in a medium-size machine, Parsons 170 wheel-type Trenchliner digs 12 in. to 25 lineal ft. of trench per minute — 20 to 32 in. wide, at depths to 5¾ feet. With this extra capacity, you get smooth, positive wheel control. Hydraulic power raises and lowers the wheel on vertical mast with fractional-inch accuracy — maintains close grade tolerance on intra-city transmission lines or mainline extensions.

Hydraulic control system on conveyor gives belt speeds up to 600 feet per minute — *completely independent of digging wheel speeds.* Belt easily handles maximum yardages from the extra-wide wheel — puts spoil bank well back beyond edge of trench. To suit various digging conditions, the 170 has round or square-bottom buckets, solid or tine backs, with "Tap-In" teeth — also, quick-change gumbo buckets. Smaller and larger wheel-type and ladder-type Trenchliners available for any trench requirement from 6 inches to 6 feet wide, up to 19 feet deep. See Parsons distributor or write us for catalog.

For a handy utility trencher that's large enough for production work, yet small enough to economically handle service connections and other small yardage assignments, check Parsons 77. This ladder-type Trenchliner is only 3 ft.-8 in. wide, and just 5 ft.-8 in. "low". It digs up to 21 lineal ft. of trench per min., 6 to 18 inches wide, at depths to 5 feet.

Mail to: PARSONS Company, Newton, Iowa *for literature on 170 Trenchliner*

NAME ..... TITLE .....
COMPANY ..... DIV. .....
STREET .....
CITY ..... STATE .....

☐ *Also send information on 77 Trenchliner*

P814 GAS

PARSONS TRENCHLINERS
A DIVISION OF KOEHRING COMPANY

WHY BURY MONEY IN NEEDLESS STREET PATCHES?

GREENLEE Hydraulic Pipe Pushers like the one shown below quickly install pipe under streets with a minimum of ditching and backfilling and *no damage to roadbeds or pavement!* A GREENLEE Pipe Pusher cuts job time and costs to a fraction. Can pay for itself on the first job — *usually* does on the first *few* jobs. Model shown pushes 3/4" to 4" pipe about 2 ft per minute with power pump. Larger unit available for larger pipe and concrete sewers. Instead of another useless street repair job, invest the same money in a valuable time-saving, worksaving GREENLEE Pipe Pusher! Write today for free literature.

TOOLS FOR CRAFTSMEN
GREENLEE

GREENLEE TOOL CO.
1948 Columbia Avenue
Rockford, Illinois

people • *Continued*

more than 25 years, Mr. Rogers has been a director of the parent company, Consolidated Natural, since 1951. In addition to his presidency of East Ohio, Mr. Ramsdell also heads Lake Shore Pipe Line Co. of Ashtabula.

GEORGE W. HORSLEY is retiring as senior vice president and director of East Ohio Gas Co., Cleveland. Mr. Horsley, a company director for 25 years, is a veteran of 43 years with the company. He started as assistant electrolysis engineer. In 1951, Mr. Horsley was elected vice president. Since 1956 he has been senior vice president.

BERNARD E. GALLAGHER and GERALD R. HADDEN are newly elected vice presidents of Consolidated Edison Co. of New York. The board also elected ARTHUR N. ANDERSON assistant vice president.

MARTIN E. LAVENS has been appointed manager of the builder division of Philadelphia (Pa.) Gas Works. He succeeds GEORGE W. MILLER, who is retiring after 43 years of service. Mr. Lavens will head a staff of builder contact representatives.

GILBERT N. BELL is the new general sales manager of Sprague Meter Co., Bridgeport, Conn. Mr. Bell joined the company eight years ago. In 1952 he was appointed field manager. Since then, he has supervised the activities of Sprague sales personnel in the field.

EDWARD D. SHEEHAN, vice president in charge of operations at Northern Illinois Gas Co., Bellwood, Ill., has been elected to the company's board of directors. Mr. Sheehan has been with Northern Illinois for 33 years.

Detroit Controls division of American-Standard has reorganized

George Horsley
East Ohio

Gilbert Bell
Sprague

FISHER Leads Again!
New Transistorized M-Scope Electronic-Witch Pipe Finder!

FIRST to build pipe finders;
FIRST to use Fiberglas cases;
FIRST to use single-turn, solid-metal loops —announces the world's newest transistorized pipe-cable finder.

Here's what exclusive Fisher transistorized design means to you:

- Greatest depth penetration
- Greatest tracing distance
- Pinpoint accuracy
- One year between battery changes
- Built-in Pulsator
- Built-in battery testers
- 90% less maintenance costs
- Built-in Leak Detector Circuit

ONLY
$220.00
Send for FREE 1958 catalog

FISHER
Research Laboratory, Inc.
Dept. G-2, Palo Alto, California
FREE 10-DAY TRIAL OFFER

Servall ALL-STEEL SERVICE BODIES

FOR ALL ½-, ¾-, and 1-TON TRUCKS

Each body electrically welded into one unit with bed reinforced. Sturdy and economical . . . weatherproof compartments with recessed paddle-handle door locks.

Write for literature on service bodies, line-construction bodies, side boxes, and King Winches.

KING WINCHES

A-11 King Winch on A-120 (4 x 4) International truck.

There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 8,000 to 19,000 lbs.

P.T.O.-driven King Winch on Willys Jeep

FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS.

Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . nothing extra needed.

King Winches for International trucks available through International dealers.

Koenig cabs and King Winches for Willys vehicles available through all Willys dealers.

Koenig IRON WORKS, INC.
P. O. BOX 7726, HOUSTON 7, TEXAS

Edward Sheehan
No. Illinios

L. L. Dollinger Jr.
Dollinger

its sales department into a sales and marketing group. As a result, F. G. COGGIN becomes general manager of the sales and marketing group. Assisting him as marketing and planning manager is F. J. KREISSL. A. L. FULLER becomes sales manager and W. H. HOHMEYER administrative manager.

LEWIS L. DOLLINGER, JR. has been named president of the Dollinger Corp., Rochester, N. Y., succeeding LEWIS L. DOLLINGER, SR., who steps up to chairman of the board. Dollinger Jr. has been vice president and sales manager of the company.

ROY V. SMITH is a new sales representative in the north-central district of the Parsons Co., Newton, Iowa. Included in the district are the Dakotas, Minnesota, Nebraska, Iowa, Kansas, Missouri, Illinois, Indiana, Wisconsin, parts of Michigan, and Kentucky.

ROBERT E. CODY has joined General Controls Co., Glendale, Calif., as manager of advertising and public relations. When Mr. Cody was with Hixson & Jorgensen Inc., he was the agency's account executive to General Controls.

AVERY C. ADAMS, president of Jones & Laughlin Steel Corp., is a new member of Equitable Gas Co.'s board of directors.

ANNE MISEYKO, assistant home service director since 1952, has been named home service director of Brooklyn (N. Y.) Union Gas Co. She succeeds RUTH B. SOULE, who is retiring.

CHARLES R. DEHAVEN has been appointed manager of public relations for Philadelphia (Pa.) Gas Works.

Several changes have been made in the gas department of Public Service Electric & Gas Co., Newark, N. J. EINER W. RASMUSSEN is now

SOONER BOOMERS "team up" for laying large diameter lines!

Construction crew at Laclede Gas Company, St. Louis, is shown lowering in a section of coated and wrapped steel main in the Kirkwood area of St. Louis. Note two Sooner Boomer units are being used, assisted by a crane. For over 2 years, Laclede Gas has made good use of their Sooner Boomer units, keeping them busy throughout the year.

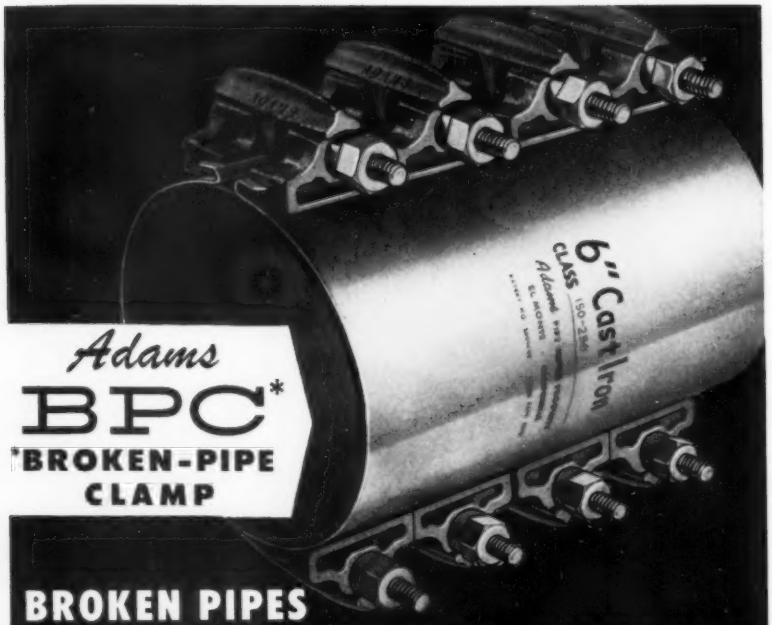
Rubber-tire mounted SOONER BOOMER does work of 2 conventional machines!

The only proven side boom on rubber tires, the Sooner Boomer —designed to handle 10" pipe— eliminates unnecessary right-of-way damage on city work as shown above. It also eliminates the need of pipe stringing along city streets ahead of ditch. A low center of gravity makes the Sooner Boomer highly stable, loaded or unloaded. Highly maneuverable, it operates at road speeds up to 27 MPH. The 12-ft. boom makes it possible to lower in over spoil. Other features include all-hydraulic operation; hydraulic controlled counter weights; power steering; perfect operator visibility; lowest initial cost and lowest operating cost! Call, wire or write for complete details now!

SOONER BOOMER MFG. DIV.
Oklahoma City Oklahoma

PHONE TR 8-2127

P.O. BOX 8686



Adams BPC*
*BROKEN-PIPE CLAMP

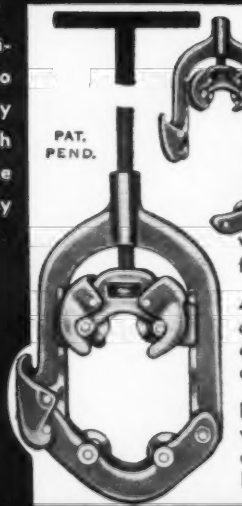
BROKEN PIPES REPAIRED in minutes!

For permanent repair, simply install beside break, slide over, and tighten . . . Stainless Steel bands, Neoprene Gaskets. Write for literature.

Adams PIPE REPAIR PRODUCTS
EL MONTE, CALIFORNIA • COLUMBIA, PENNSYLVANIA

IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

people • *Continued*

distribution staff engineer. He is succeeded as division superintendent, Passaic division, by T. ROGER HOBBIS. JOHN F. O'NEILL, division service engineer, succeeds Mr. Hobbis as division staff engineer.

LEW B. PHILLIPS has joined Dresser Manufacturing Division, one of the Dresser Industries, as district manager, gas industry sales. His territory is in the Great Plains states with headquarters in Kansas City, Mo.

Lew Phillips
Dresser Mfg.

George Maass
Schield Bantam

GEORGE H. MAASS has been appointed assistant general sales manager for the Schield Bantam Co., Waverly, Iowa. Mr. Maass, a veteran in the construction machinery industry, comes to Schield Bantam from LeTourneau-Westinghouse, where he was export manager for the past three years.

W. R. TAPPAN, executive vice president and general manager of the Tappan Co., Mansfield, Ohio, is now president of the company. He succeeds ALAN P. TAPPAN, who has been elected chairman of the board. W. R. Tappan will continue his duties as general manager.

LEWIS V. SMITH has been promoted to district sales manager in Cleveland for Robertshaw Thermostat Division, Robertshaw-Fulton Controls Co. His territory includes northern Ohio, western New York, western Pennsylvania, and West Virginia.

KENNETH R. TEELE has resigned as treasurer of Stone & Webster Service Corp. to become president of Mobile (Ala.) Gas Service Corp. Succeeding him at Stone & Webster is NELSON J. AMBROSE, who has been assistant treasurer since 1943.

Mr. Teele will also serve as a director of Mobile Gas. He succeeds MAURICE WHITE, who has resigned, in both posts.

WILLIAM H. MUCHNIC, president of the LFM Manufacturing Co., Inc., Atchison, has been elected a vice president of the parent company, Rockwell Manufacturing Co., Pittsburgh.

JOHN W. VANCE has been promoted from assistant to director of public relations of International Harvester Co. He succeeds the late Dale Cox.

Four men have been promoted in the gas engineering department of the Columbia Gas System Service Corp., Columbus. LOWELL L. ELDER and ROBERT S. RYAN are supervisory engineers. ROBERT R. WRIGHT and ROBERT M. FORREST are assistant senior engineers.

LAWRENCE M. DURYEE, division industrial sales engineer of the Connecticut Light & Power Co.'s western division at Waterbury, Conn., has been named division sales engineer.

WARREN J. COLLINS has been appointed general counsel for Lone Star Gas Co., Dallas, and its wholly owned subsidiary, Lone Star Producing Co. He succeeds MARSHALL NEWCOMB, who has retired. Mr. Newcomb also has resigned as director and vice president of both companies.

JAMES H. ERWIN is a new vice president of Central Illinois Electric Light & Gas Co., Rockford, Ill.

GUNNAR JOHANNSSON is the newly appointed district gas superintendent with the Saskatchewan Power Corp. for the Weyburn and Estevan area.

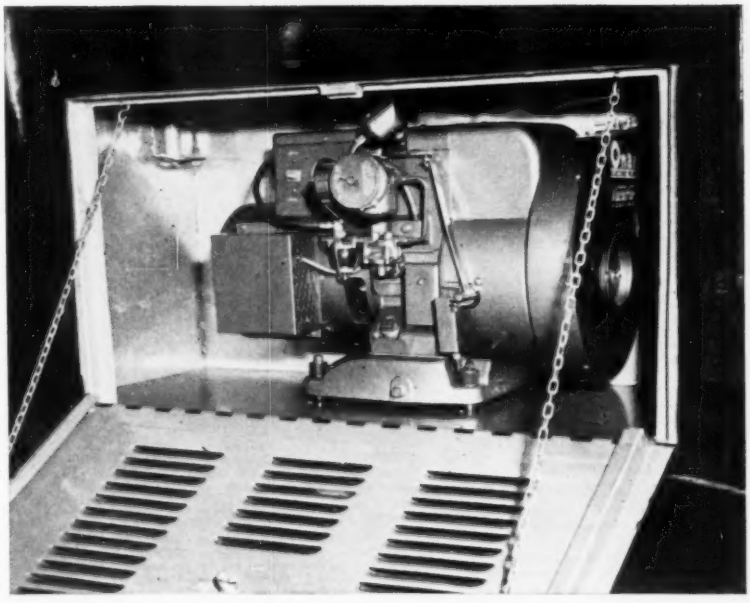
LOUIS J. WAGNER, manager of the sales engineering bureau at Consolidated Edison Co. of New York, was elected chairman of the Metropolitan Gas Heating & Air Conditioning Council.

EVERETT A. TAYLOR has been elected vice president and general sales manager of Providence (R.I.) Gas Co. He has been serving as general sales manager. FRANCIS J. MCLAUGHLIN JR., formerly residential sales manager, is now assistant general sales manager and residential sales manager.

Onan ELECTRIC PLANTS

ELECTRIC PLANT NEWS

Onan ELECTRIC PLANTS



New dual-purpose Onan plants deliver A.C. power for tools; 30 amps for battery charging!

1,000 and 2,000-watt models available

Mounted in maintenance and construction vehicles, these two new Onan Electric Plants cut costs two ways.

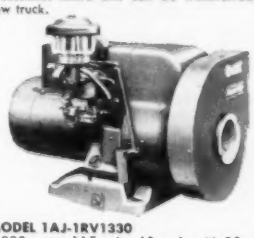
First, they provide plenty of plug-in A.C. power for floodlights and motor-driven tools.

Second, they keep communication batteries charged without running the truck engine. The 30-ampere, 12-volt output handles the drain of 2-way radio and battery-powered lighting.

The difference in fuel cost between the single-cylinder Onan engines in the 2 to 4 H.P. range and truck engines of 150 H.P. or more has been reported as high as $800.00 per year or approximately twice the cost of the 1KW plant. To these fuel savings must be added savings in engine maintenance and reduction in labor costs.

These plants can be mounted within the truck body or above the cab in an Onan weatherproof steel housing. Leading body builders will install them to order. Plants are electrically started from the truck cab. Separate charging circuit keeps starting batteries charged. Call your Onan distributor for the whole story.

OVER-THE-CAB MOUNTING
Protected by Onan steel housing. Plant easily accessible. Entire unit can be transferred to new truck.



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people • *Continued*

W. W. HARRIS has been named vice president-marketing of Roots-Connersville Blower Division, Dresser Industries, Inc., Connersville, Ind. He will be responsible for the marketing of Roots-Connersville equipment throughout the U. S. and Canada. Mr. Harris formerly was with General Electric.

HERBERT A. BLAIR is the newly elected comptroller of Central Illinois Light Co., Peoria, Ill.

DR. GEORGE H. POTTER and ALTON H. WALLACE have joined the development department of Union Carbide Chemicals Co., division of Union Carbide Corp., at South Charleston, W. Va.

FRANK L. CESERANI, former superintendent of gas distribution and utilization for Montana Power, has joined Washington Water Power Co. as chief gas engineer.

JAMES O. COCKRELL has been named assistant secretary and assistant treasurer of Piedmont Natural Gas Co., Charlotte, N. C. He succeeds W. GRAVES ARMSTRONG, who recently became secretary of the company.

OHMER ULLERY, assistant treasurer of Ohio Fuel Gas Co. since 1947, has been elected to the same post in the Columbia Gas System Service Corp. Mr. Ullery has been associated with Columbia group companies since 1922. His new duties will include coordination and general direction of all accounting and treasury activities of the service company in Columbus, Ohio.

ROBERT K. ESKEW has been named director of engineering, research and development for Arkla Air Conditioning Corp. Mr. Eskew will headquarter in Evansville, Ind. He has been associated with gas absorption refrigeration and air

Ohmer Ullery
Columbia Gas

W. W. Harris
Roots

Dewitt Pike
Rochester Gas

Frank Sawyer
Pritchard & Co.

conditioning work since 1936, when Servel Inc. began development of the all-year gas air conditioning units. Previously, Mr. Eskew had been with the Servel organization since 1928, principally in sales and field engineering.

Berry Hydraulics has added H. S. CAIN and R. O. MLADY to its general office sales engineering staff in Pittsburgh. Mr. Cain previously was with the company in Houston. Mr. Mlady had been an application engineer at Berry's Corinth, Miss. plant.

BURDETTE A. JOHNSON has been elected treasurer of the New England Gas & Electric Association. Mr. Johnson also was elected treasurer of the association's subsidiaries. JOHN MACLACHLAN, currently secretary and assistant treasurer of the association, becomes its comptroller. He was also elected comptroller of the subsidiaries. The election's result from the forthcoming retirement of H. COLEMAN MOORE JR.

FRANK S. SAWYER has joined J. F. Pritchard & Co., Kansas City, Mo., as manager of construction. W. H. MACKAY has retired after 19 years with Pritchard. He is succeeded as manager of the Houston office by R. H. BRADLEY.

ARMOR B. MARTIN has been appointed an assistant vice president for Washington Water Power Co., Spokane. Washington Water recently acquired Spokane Natural Gas Co.

R. DEWITT PIKE has been elected a vice president of the Rochester (N. Y.) Gas & Electric Corp. Mr. Pike joined Rochester in 1927. After a series of promotions, he became manager of the commercial and industrial sales departments in 1950. In 1952 he was

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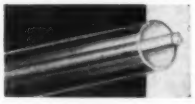

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named general sales manager and in 1953 became director of employee relations, the post he held until his present appointment.

A. G. PRASIL has joined the home office engineering staff of Southern Union Gas Co., Dallas. He comes to Southern Union with several years' experience in the field of public utility engineering.

ROBERT M. OLSON, JR., is assistant counsel of Southern Counties Gas Co., Los Angeles. Mr. Olson, former secretary and trust officer of Security Title Insurance Co., succeeds JOSEPH R. RENSCH, now assistant vice president and special counsel of Pacific Lighting Gas Supply Co.

WILLIAM L. NEELY, assistant controller, and GEORGE E. DANIELS, credit manager, of Rockwell Manufacturing Co., Pittsburgh, have been promoted to assistant treasurers. Also promoted recently was FRANCIS A. CURRY, who is now headquarters personnel manager.

ROLF R. COLPITTS has been appointed manager of the industrial and commercial sales department of Northern Ontario Natural Gas Co. Ltd., Toronto. Formerly, Mr. Colpitts was in charge of industrial and commercial sales and gas utilization.

Deaths

ALBERT B. SHELTON, 72, retired assistant treasurer of Lone Star Gas Co., Dallas, died recently.

ERNEST G. DE CORIOLIS, director of research of Surface Combustion Corp., died recently in Toledo, Ohio. He was 75. Mr. de Coriolis, a nationally known engineer, specialized in the industrial heating field.

E. R. BONNIST, advertising director of Cooper-Bessemer Corp., Mt. Vernon, Ohio, died in July just as this issue of GAS was going to press.

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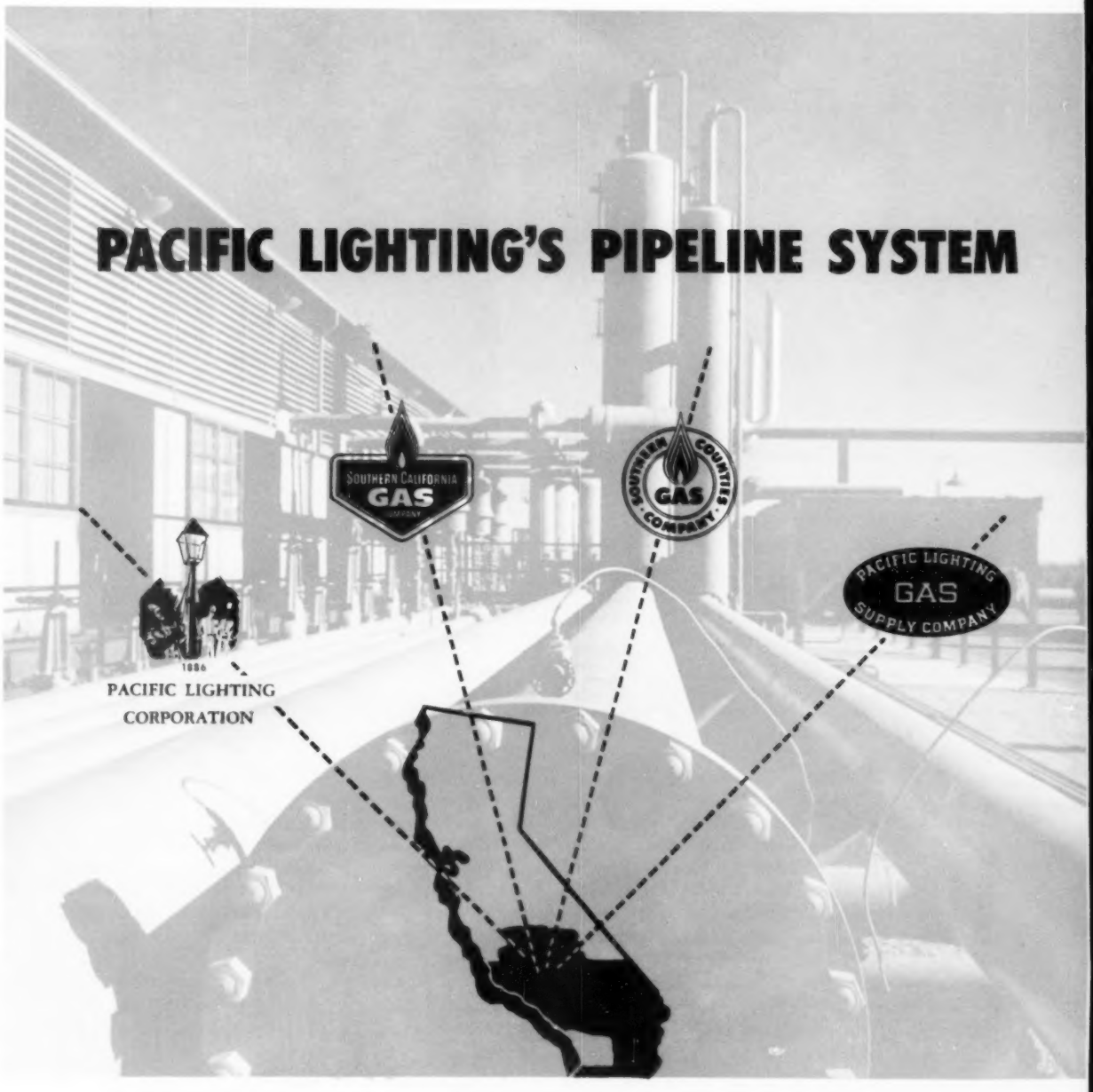

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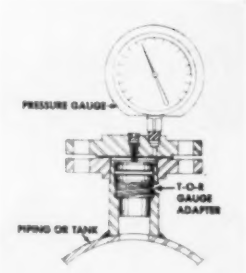

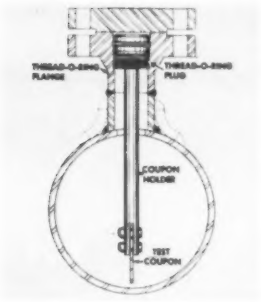

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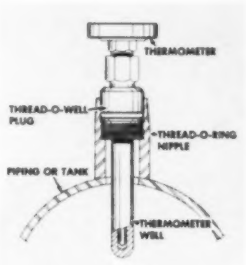

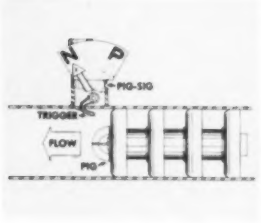

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The gas supply for Pacific Lighting System

PLGS's compressor plant at the Goleta (Calif.) underground storage field.

By J. FRED EBDON, Editor

MAN and his progress are so tied to energy that we can say energy supply is the basic requisite for life as we want to live it on this world. Nothing is made or moved without energy consumption or conversion.

Nowhere in the world is energy consumption higher or growing faster than in these United States. And it follows that the standard of living is higher in the U. S. than in any place in the world. The two go hand in hand, just as every phase of civilized progress goes hand in hand with energy consumption.

In the United States we have these energy sources: solid fuels, mostly coal; petroleum; natural gas; water power, and nuclear. In California, the picture is quite different. There are no commercial resources of solid fuels. That coal which is imported is used largely for metallurgical purposes, and it can be said that this is being displaced by petroleum coke.

Water power has been exploited to just about its economic limits in the state. The Pacific Southwest Power Interchange Area was generating an estimated 58 billion kwh of electric power per year on Jan. 1, 1958. Thirty-three billion kwh was produced from thermal generation; hydroelectric power generated 25 billion kwh. Yet, PSPIA estimates that the hydroelectric resource will account for only about 28 billion kwh in 1975—an increase of little consequence when compared with the increase in total electric power requirements for the state by that year.

Nuclear power became available to California in 1957 at a modest rate. These are, of course, strictly experimental plans. Authoritative scientists tell us that the energy available from this source between now and 1975 will be less than the expected error in total energy consumption estimates for the period—hence, it is minor.

So, California has the fossil fuels and water power. Little increase can be expected from water power sources as the state's energy demand grows, so the burden is squarely on natural gas and petroleum for the practical future.

California has a well-known onshore and offshore petroliferous geology. It has small, deep, prolific gas and oil bearing reservoirs that have resulted in a long record of production. Unhappily, the state is "over the hill" in fossil fuel production. The peaks of exploration, drilling and production have passed. It is energy deficient within itself.

Offshore California may produce as much as 100,000 bbl/day of crude oil and about 55 MMcf/day of associated natural gas by 1966. Bankers tell us that California onshore production will have declined to about 860,000 bbl/day of crude oil and about 1150 MMcf/day of natural gas by the same date. But any way you slice it, local fossil energy production is declining in the state while the total energy require-

ments are rapidly climbing. For further proof, California is currently an importer of oil and over 58.3 per cent of its natural gas flows in from out of state.

California has fine deep-water port facilities, so it will be no problem to lay down crude oil or products from any part of the world's supply, including that sourcing from U. S. fields. Pipelines bring additional crude and products into the state. Other surface transportation media can be depended upon, too. In fact, the Southern Pacific Railroad has even built a petroleum pipeline into southern California.

Petroleum products are, of course, the answer to energy for land, air, and water vehicle fuel. And in southern California they need a lot for that purpose. It burns efficiently, but a bit untidily, which doesn't enhance its desirability for the homes and industry in air-pollution-conscious southern California.

Some features of petroleum and petroleum product supply warrant consideration.

For one thing, petroleum and products are much more sensitive to world economic and political fluctuations and frustrations than is natural gas. During the recent Suez crisis, importations to the United States were sharply curtailed. In fact, the U. S. oil resources were thrown open to the free world through exports that played havoc with domestic (U. S.) flow cycles. Naturally, oil fuel prices responded with reflected dipsy-doos. In the modern world such geopolitical developments are expected at any and all times. Or, in short, petroleum energy supply can be "long or short" as the cold wars continue. The American oil industry will not be caught seriously short, for it does an outstanding job, but it cannot prevent these sudden harassments to industrial and other fixed-plant customers.

Also, turning our attention to California more specifically, the state experiences increasing dependence upon automobile transportation. This not only ups petroleum requirements in general, it means the petroleum industry concentrates on lighter fractions at the expense of fuel oils suitable for fixed-plant use. Although currently in surplus, residual fuel oil supply —the liquid fuel most used for thermal power generation—is considered on the short side from the long-range point of view. And there is not too much to urge an optimistic view for considerable improvement.

Table 2 shows the changes in California's energy requirements experienced during 1945 to 1955, and the estimated change in requirements during the period 1955 through 1961.

Presently, about 34.7 per cent of the fuel oil and 18.4 per cent of the natural gas used in California are burned under boilers for electric power generation. California currently has requirements for some 58 billion kwh of electric power per year. The Pacific Southwest Interchange Area will need to generate about 88 billion kwh in 1965. So fossil fuels for this purpose will be needed in additional volumes; and, with the long range outlook unfavorable in spite of the currently favorable residual fuel oil situation, it appears probable that natural gas will fill the major part of the deficiency.

The total annual sendout for the Pacific Lighting System in 1957 was about 535 billion cu ft. Of this,

TABLE 2. CHANGES IN CALIFORNIA ENERGY REQUIREMENTS.

Fuel or Service	Increase 1945-55%	Estimated Increase 1955-61%
Natural gas (domestic, commercial and industrial)	114	37
Power generating fuel (both natural gas & residual fuel oil)	243	62
Oil fuel (industrial & other fixed plant)	11	—1.3
Vehicular fuel	97	31

116,718 MMcf was purchased from California producers; 331,630 MMcf was purchased from Pacific Lighting's single out-of-state supplier—the mighty El Paso Natural Gas Co. The rest was received from underground storage and exchange. Thus, out-of-state gas accounts for about 70 per cent of the total sendout (part of the storage gas was purchased out-of-state).

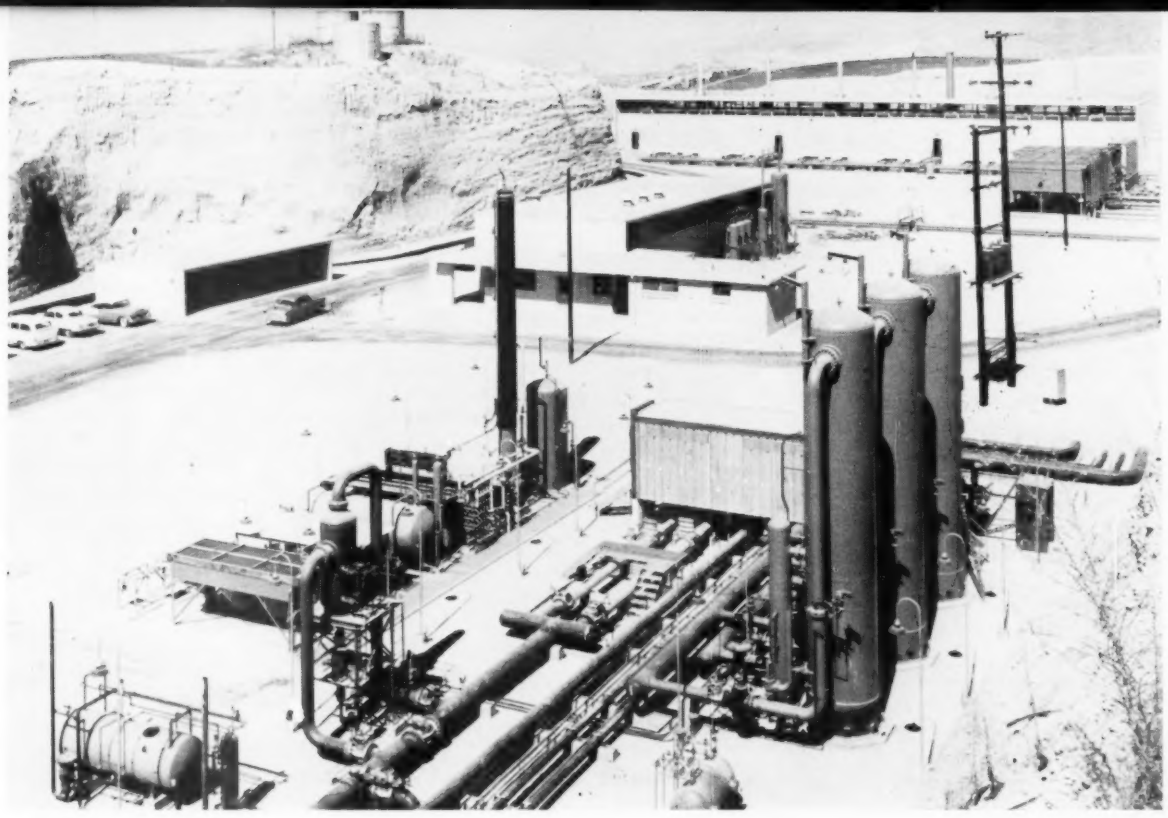
The major volume of California-produced gas comes from three producing areas: the San Joaquin Valley fields, the Coastal fields, and Los Angeles Basin fields. It is interesting to note that most of these producing regions are within the service area of Pacific Lighting System.

The San Joaquin Valley region produces about 39 per cent of the local gas. However, it, like the others, is declining and these sources are not expected to be larger than at present. Of course, ultimate depletion will take some years, but unless some booming strikes are made (highly unlikely, but certainly not impossible), the Pacific Lighting System will have to go out-of-state for more gas to serve the expected increase in demand.

El Paso Natural Gas' pipeline system opened the door to out-of-state gas for California in 1947. Since then, this large volume long-line system has expanded all over west Texas, New Mexico, and Arizona with facilities primarily designed to produce, gather, process and transmit gas to this hungry California market. El Paso Natural has about 65 customers, but none of them has a demand anything like the ones tied-on at the California-Arizona border. Pending some problems, El Paso Natural seeks to hold its acquisition of the "Scenic Inch" pipeline of Pacific Northwest Pipeline Corp., which operates from the San Juan basin through Colorado, Utah, Wyoming, Idaho, Oregon and Washington to the U. S.-Canada international boundary—near Sumas, Wash—where it interconnects with Westcoast Transmission Co. Ltd.'s pipeline that taps the prolific Peace River fields of Alberta and British Columbia.

The Pacific Lighting companies in southern California have certainly played a major part in the development of the El Paso System to its present vast, efficient size. El Paso Natural Gas Co., in turn, has always been ready to expand its system for the delivery of the increasing gas volumes. Together, the mutually supporting systems deserve the plaudits of the gas industry and the gas-consuming public.

Major sources of natural gas that El Paso Natural pipelines into southern California are the Permian

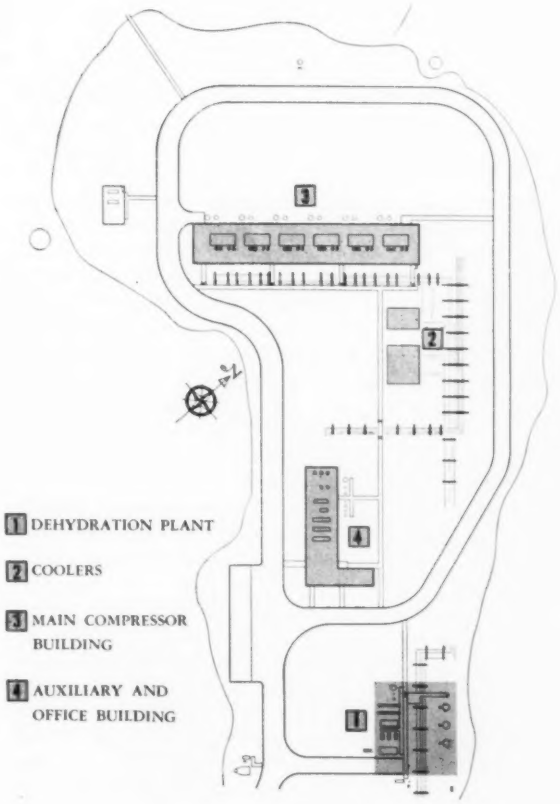


basin of Texas and New Mexico; Panhandle field of Texas; and the San Juan basin of New Mexico and Colorado. Significant, too, are the really tremendous reserves of Canadian natural gas in the Peace River fields and in the fields on the eastern slope of the Rocky Mountains, near Calgary, in Alberta. Gas from these essentially virgin reservoirs can flow to southern California when certain geographical, political, and diplomatic problems are resolved. It is significant to point out that Canadian gas presently flows across the International Boundary. Westcoast Transmission is delivering more than 200 MMcf/day to Pacific Northwest Pipeline Corp., and has been doing so since Oct. 3, 1957. Pacific Northwest's distribution company customers in both Washington and Oregon are served primarily with Canadian natural gas.

From the fields previously mentioned in Texas, New Mexico, and Colorado, and in other fields, El Paso Natural's geologists put gas reserves owned or controlled by the company at an all-time high of 33.9 trillion cu ft. In addition, Pacific Northwest Pipeline has another 13.3 trillion dedicated to it. And El Paso Natural continues to seek still more gas reserves by lease-holds and drilling from British Columbia, Canada to offshore Louisiana.

The 1957 deliveries to Southern California Gas Co. and Southern Counties Gas Co. of California from El Paso Natural were 331,630 MMcf. The Pacific Lighting System had 966 MMcf/day available for peak day requirements during the 1957-58 heating season. For the 1958-59 heating season, total peaking gas from El Paso Natural will be 1.143 billion cu ft/day. Pipeline and facilities are nearly completed on both sides of the California-Arizona boundary to effect this increased delivery.

Overall view (above) of the PLGS Montebello storage field compressor plant. Diagram shows various components of the plant.



In addition, Southern Cal and Counties have signed agreements (during 1957) with El Paso Natural calling for a new supply of 400 MMcf/day; with delivery of one-half of this volume targeted for 1960, and the other half before 1962. But a few things must transpire before these increments are realized.

First, the program requires new facilities in the Pacific Lighting, El Paso Natural, Pacific Northwest Pipeline, and Westcoast Transmission systems. El Paso and Pacific Northwest Pipeline will have to obtain FPC certification for the construction projects and deliveries, assuming that other factors are resolved.

But most important is the politico-economic question raised in Canada as to the propriety of exporting additional volumes of natural gas to the U. S. for anybody's project. This will be settled—one way or another—by, probably, an interim report of Canada's Borden Commission. This could be forthcoming in the late fall of this year. In essence, the 16.8 million people in the Dominion of Canada are going to decide if exportation from Canadian reserves from the three western provinces—estimates at 26 trillion cu ft now, 87.2 trillion cu ft by 1972, and still going strong with new discoveries almost daily—will imperil Canadian natural energy resources.

Too, it is highly probable that from the Borden Commission will come the establishment of a Canadian governmental agency somewhat like our Federal Power Commission that will have to establish the public feasibility of the Canadian facilities required to move natural gas from one place to another. If so, Westcoast Transmission will then have to receive authorization to build its additional facilities, even after the Borden Commission approves further exportation—if, in fact, it so finds.

(The construction projects required for this Canadian gas delivery from El Paso Natural to Pacific Lighting are detailed in the pipeline section of this article.)

Still another project involving Canadian natural gas and southern California bears discussion. This is the proposed Alberta & Southern-Pacific Gas Transmission system (essentially a Pacific Gas & Electric Co., San Francisco, project). This plan would pick up gas from fields on the eastern slopes of the Rockies and bring it into the San Francisco Bay area via a pipeline route that would cut through Idaho, Washington, Oregon and northern California. When it was announced, PG&E planned to offer one-half of the initial capacity (200-odd MMcf/day) to Pacific Lighting System. The Canadian developments apply here in parallel with their effect on the El Paso Natural Canadian gas project. Also, FPC will have to certificate the International Boundary-to-northern California line.

However, a new pipeline between San Francisco and Los Angeles would be required. And Pacific Lighting officials aren't saying whether they do or do not want this gas if and when it is available. No application for the line has been filed with the California Public Utilities Commission. Nor has PG&E filed with FPC for its line from Canada to San Francisco. However, Alberta & Southern has been very busy lining up gas purchase contracts dealing with respectable volumes of gas in Alberta.

As succinctly as we can put it, we feel Canadian gas is definitely headed for southern California. And just as succinctly, it will be some time before it gets here.

To its credit, the Pacific Lighting System is not putting full dependence on Canadian resources for future supply. An agreement was concluded with Transwestern Pipeline Co. of Houston in February 1958. This proposed project will deliver 400 MMcf/day of natural gas from fields in west Texas and New Mexico to Pacific Lighting Gas Supply on the California-Arizona border near Needles. Transwestern Pipeline is a new company on the U. S. gas industry scene. It has filed for an FPC certificate to construct its pipeline and PLGS has filed with the California PUC for California-side construction.

All of these proposed new deliveries are designed to meet growing requirements of firm customers and make sufficient gas available for the major portion of the thermal thirsts of industrial customers for at least the next several years.

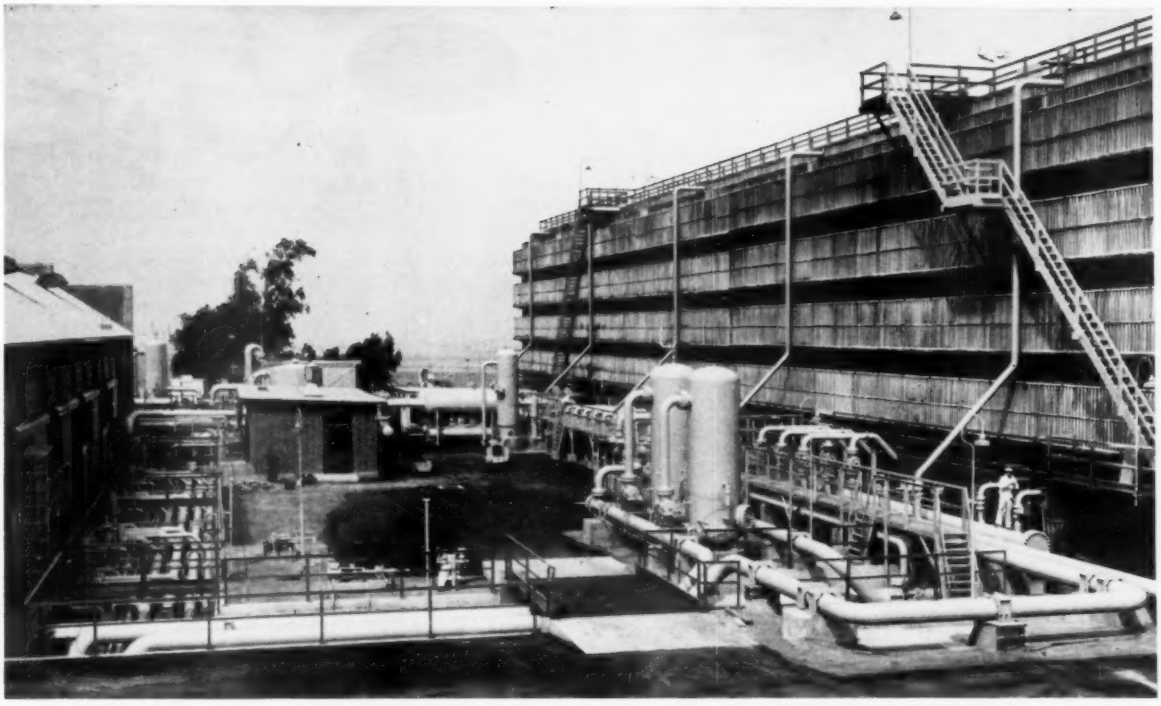
Prices for the new gas under these proposed deliveries will be higher than the average price for California gas and gas from El Paso Natural in 1957. However, the average price of all the gas that will then be commingled in the system is expected to enable the distribution companies to sell industrial gas at lower prices than present delivered costs of equivalent residual fuel oils.

As has been mentioned, the all-time actual peak day experienced by Pacific Lighting System hit on Jan. 29, 1957. The mean atmospheric temperature for the 24-hr period was 44.8°F. On that day, the gas supply looked like this:

Gas From	Volume, in MMcf	
California oil well (wet) gas (normally available)	480.6	
California gas well (dry) gas (normally available)	45.0	
Out-of-state gas (El Paso Natural Gas Co.)	841.6	
Receipts from other utilities	10.7	
Underground storage	420.0	
SUB-TOTAL (normal gas supply)		1797.9
California emergency gas (available for firm peaks only)	206.2	
Inventory change (line draft)	0.5	
TOTAL SUPPLY	2004.6	

That shows what went into the system. Here is what came out:

Load Served	Volume, in MMcf	
—Firm Demand—		
Domestic and commercial	1626.8	
Firm industrial & gas engine	80.6	
Firm oil company exchange	4.1	
Firm exchange with other utilities	12.6	
Firm wholesale	146.0	
Unaccounted-for gas & inventory change	32.9	
System compressor fuel & incidentals	18.5	
SUB-TOTAL FIRM DEMAND SERVED		1921.5



A view of Southern California Gas Co.'s compressor station at the Playa del Rey storage field in suburban Los Angeles.

—Interruptible Demand—	
Regular industrial	6.9
Oil company exchange	48.8
Exchange with other utilities	curtailed
Steam-electric generation	curtailed
Wholesale	curtailed
SUB-TOTAL INTERRUPTIBLE DEMAND SERVED	55.7
TOTAL NATURAL GAS SERVED	1977.2 MMcf

During this peak day there were 27.4 MMcf in excess supply, mostly in line pack. The total interruptible gas curtailed to meet firm demand was 1016.6 MMcf.

This peak was not bettered during the 1957-58 heating season. However, it could have been, as follows in less detail.

Gas From	Available for 1957-58 Peak, in MMcf
California oil well gas	505
California dry gas	43
Underground storage	936
California emergency gas	161
Out-of-state gas (El Paso Natural Gas Co.)	966
TOTAL GAS	2611 MMcf

For the peak day in 1958-59's winter season, the following gas supplies will be available. These data are for a calculated extreme peak day which would have an average temperature of 36°F. Such a day has not been experienced in southern California since 1937:

Gas From	Available for 1958-59 Peak, in MMcf
All California sources	853
Out-of-state (El Paso Natural Gas Co.)	1143
Underground storage	986
TOTAL GAS	2982 MMcf

Any utility's standard of service is measured substantially by its ability to have gas service in volumes that will meet the peak demands of its residential and commercial customers. In southern California, natural gas is accepted as the ideal fuel for domestic, commercial and industrial applications. Both population and customers are large and growing in Pacific Lighting's gas distribution area. Add to this the impact of the need for more industrial gas. It is easy to see that the system will require more gas supply in the not too distant future. It has plans as firm as they can be under current relationships and governmental control of the gas industry for a major portion of this additional gas requirement. But still more gas is needed. Having talked with numerous officials of the system and gained a lasting impression of their serious regard for gas as the basic element for further progress of southern California—and having heard their deep appreciation of their public service obligation—there is no question in our mind but that Pacific Lighting System will have gas available in the volumes needed to serve its customers for the future years.

Pipeline systems

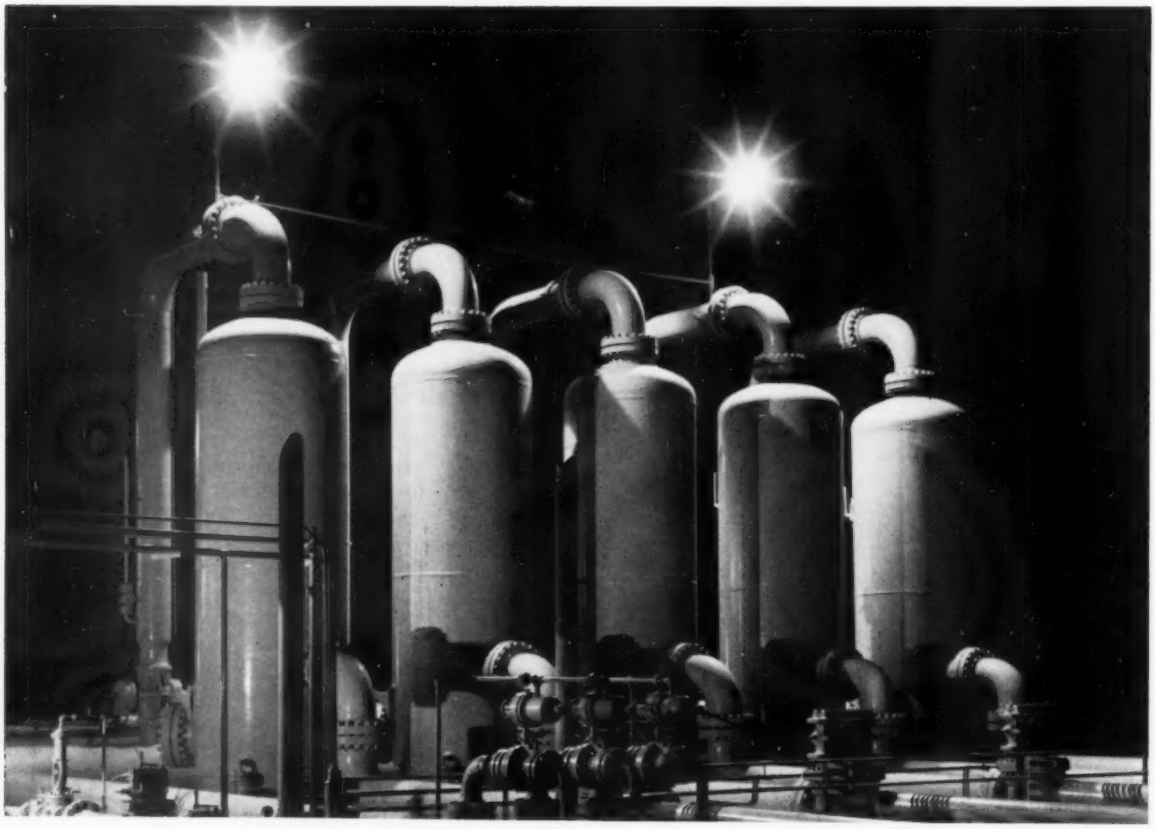
PACIFIC LIGHTING GAS SUPPLY COMPANY
SOUTHERN CALIFORNIA GAS COMPANY
SOUTHERN COUNTIES GAS COMPANY
1886
PACIFIC LIGHTING CORPORATION

IN the chilling, still quietness that characterizes nights in California's Mojave desert, which spreads southwestward from the southern end of the high, cool Sierra Nevada range, the sagebrush wanderer is apt to feel and hear the vibrant pulse or whine of machinery. It doesn't seem at all appropriate for power-packages of man's industrial age to be out in this crystal-clear solitude. To further break a reverie, a jet aircraft whooshes through the ethers high overhead. Both spell horsepower to the engineer.

Leaving the jet on its flight to no telling where, if the desert tramper will investigate the throbbing and the whine, he will find spaced across the expansive wasteland and nestled against the Colorado river, mighty natural gas compressor stations powering energy transmission in the Pacific Lighting System. They are moving energy that keeps southern California alive. Moving energy to make it bloom under still more spectacular development. Moving natural gas—energy in the efficient, the preferred, the valued form.

Pacific Lighting System's southern California operations require huge volumes of out-of-state gas. Three 30-in. pipelines provide the steel conduits for its transmission from the California-Arizona border, across the arid and inhospitable Mojave, into metropolitan Los Angeles.

Some of Pacific Lighting's out-of-state gas has made the long (1200 miles) trek from west Texas. All of it has travelled at least 500 miles in the 1 trillion cu ft annual capacity El Paso Natural Gas Co. system. It could have taken several routes through El Paso Natural's 9292-mile, 940,125-hp, $1.3 billion pipeline network. This system takes southern Cali-



fornia bound natural gas to the very middle of the Colorado river. From there on, it is up to Pacific Lighting System.

This arrangement got started in 1947 after El Paso Natural, Phillips Petroleum and Pacific Lighting System officials agreed on the obvious—a great natural gas transmission system had to be built to bring out-of-state natural gas to California. The initial El Paso Natural pipeline facility has been constantly expanded and other lines built to take care of the West coast market. El Paso Natural has always stayed on top of it.

The Pacific Lighting System connects to the El Paso Natural pipelines at two points. One is at the Colorado near Blythe, Calif., and Ehrenberg, Ariz. The other is 90 miles or so north at the river near Needles, Calif. and Topock, Ariz. The Blythe-Los Angeles lines are called the Texas pipeline; and the Needles-Los Angeles link is styled the Needles pipeline.

The Texas pipeline system consists of two parallel, 30-in. OD, arc-welded steel pipelines. Gas feeding it is measured for billing purposes at El Paso Natural's Ehrenberg station. Just a few miles on the California side of the river, the big-inchers hit the initial compressor station on the SoCal-SoCounties jointly owned, Southern Counties-operated transmission property. Deliver pressure at the Colorado river is 500 psig, and 6.5 miles to the west at the Blythe compressor station it has dropped to 475 psig.

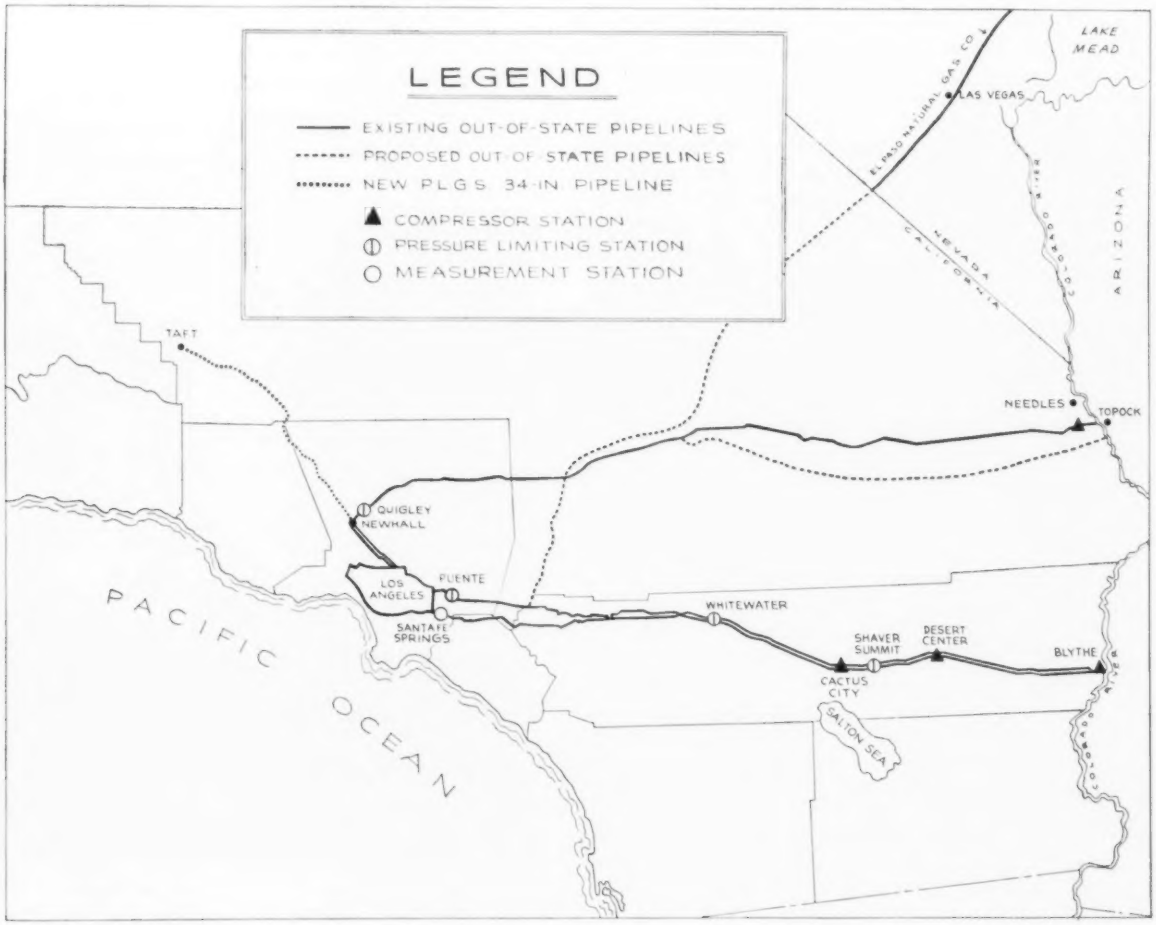
Blythe compressor station is a straight reciprocator. Fifteen Clark engine-compressor units rated cumulatively at 25,280 hp are installed. They boost pressure to 807 psig.

For the next 43.55 miles, the twin pipelines cut through sparse desert country to reach Desert Center —well and truly named—booster station. Here a General Electric gas-fired turbine prime mover drives a DeLaval centrifugal compressor. The booster is rated at 5700 hp.

The next point of interest along the Texas pipeline is the Shaver Summit pressure limiting station, which limits flowing pressure to 725 psig, and holds it to less than that value on downstream. The pressure limiting facility is 22 miles from Desert Center and a little over eight miles from the next downstream compressor point—Cactus City booster station. At the latter, another G-E turbine powers a centrifugal compressor, rated at 5700 hp.

Forty-four miles toward Los Angeles, out-of-state gas hits another installation—Whitewater pressure limiting station. The unit is designed to limit the downstream pressure to a maximum of 655 psig.

The parallel lines start spreading on the outlet



On the PLGS 34-in. pipeline, bellholes were dug at 80-ft intervals to give the stringer bead welders working room for field welding two double-jointed segments.

side of Whitewater station. The southern 30-incher runs 30 miles to the Moreno crossover—a 30-in. OD line tying the two mainlines together at the point of the offtake to San Diego Gas & Electric Co. The lower mainline branch has the Orinda pressure limiting station 45.5 miles from the crossover. Downstream pressure is limited to 465 psig in the 12.04-mile stretch that brings gas to Santa Fe Springs measuring station and, from there, is routed by Spence St. into the distribution systems.

From the Moreno crossover, the 30-in. northern branch of the Texas pipeline extends 52 miles to Puente pressure limiting station, where it delivers its gas to the distribution systems through a 465-psig maximum working pressure line.

There are numerous off-take points to Pacific Lighting System divisions along the Texas pipelines west of Desert Center.

The big, new 30-in. Needles pipeline is similarly constructed. The country it traverses is also rugged and on the desert-side of things. It is jointly owned by SoCal and SoCounties, but operated by SoCal.

Needles compressor station is the single power plant designed into this pipeline for its initial operation. This installation is 10 miles from the middle of the river. Four Clark reciprocators accomplish the repressuring with a total of 8000 hp.

From Needles, natural gas in this pipeline takes a westward flow for 209 miles to the Antelope valley off-take and another 25 miles to Quigley pressure limiting station. Quigley limits the downstream pressure to 465 psig. The maximum working pressure of the mainline from Needles to Quigley is 936 psig.

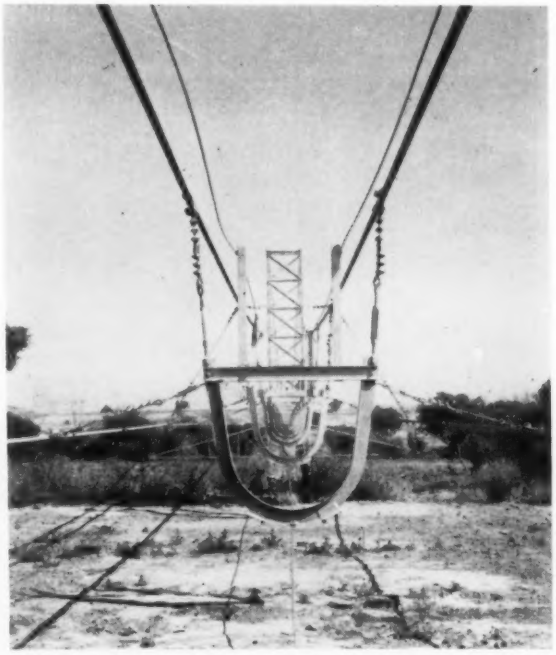
Natural odor of the gas delivered by El Paso Natural is usually sufficiently strong so there is no need for odorization at Blythe and Needles. However, Titrilog units are installed at both points to monitor odor and odorizers are in working order when needed.

The Texas and Needles pipelines are both under complete cathodic protection. SoCal and SoCounties handle their own cathodic protection design, installation and maintenance.

Pacific Lighting Gas Supply owns and operates a 26-in. OD line from the North Dome of the renowned Kettleman Hills fields to the Los Angeles basin. This older line picks up gas along its route from a number of local producers. It works through the San Joaquin valley, over the Ridge, and through the San Fernando valley to tie-in with Pacific Lighting System's metropolitan Los Angeles distribution grid at Glendale station. This pipeline has no mainline compression facilities.

There are many other short but important "pipelines" operated by the three operating companies. Actually, any line in the Pacific Lighting System carrying gas destined for two or more divisions is classed as a pipeline. So, in a system such as this one there will be myriad pipelines. But the Texas and Needles pipelines are the backbones.

Nearing completion, if not completed by the time this is read, is a brand new Pacific Lighting Gas Supply pipeline. This one is an 82-mile, 34-in. OD, steel tube extending from Coles Levee, Calif. (near Taft) to SoCal Gas Co.'s Quigley measuring station near Newhall. It will add a delivery of 648 MMcf/day of locally produced natural gas to the integrated sys-



Cable-hung pipe hangers line up symmetrically on the 1325-ft long pipeline bridge crossing the Santa Clara dry wash (river).

The big Blythe reciprocating station starts gas flowing through the Texas pipelines system at 807 psig. Fifteen engines developing 25,280 hp do the job.

tems of the Pacific Lighting network. Major sources of this new gas supply are a Richfield Oil Co. plant in Coles Levee, and a Western Gulf unit at Paloma.

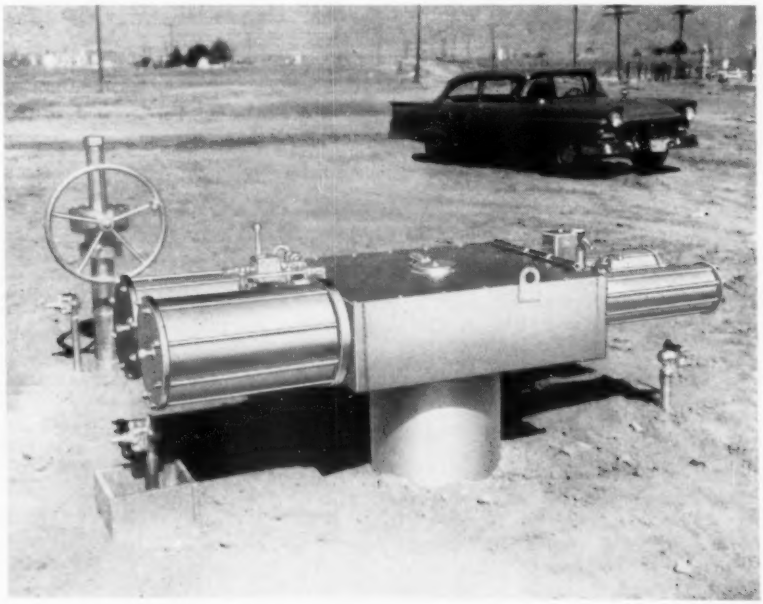
Thirty-four inch pipe in four wall thicknesses was used in the design. For Class I location work—0.416-in.; Class II—0.500-in.; Class III—0.566-in., and for special locations—0.600-in.

The pipeline crosses six dry washes on its route. It makes a 1000-ft underground crossing of the Kern river. Five overhead crossings are made—three in the Liebre gulch region, one over Castaic creek, and one over the Santa Clara river. The latter is a 1325-ft span. Overheads are made via fairly conventional pipeline suspension bridges. Pipe wall specified for all overhead river crossings was 0.566-in.

As is the policy of PLGS on its construction jobs, it purchased all of the API 5LX-52 line pipe used for its project. This was turned over to Pacific Pipeline Construction (Montebello, Calif.) for double jointing, and yard coating and wrapping. Pacific Pipeline set up two yards; one at Arvin for the northern half of the line, the other at Castaic junction for the remainder.

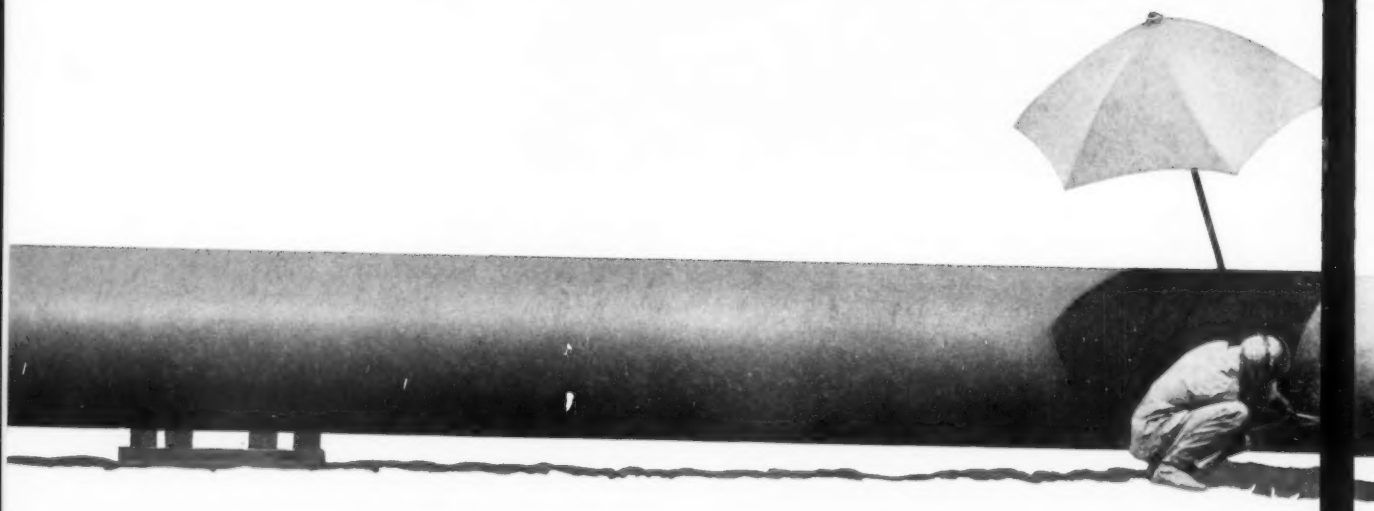
The 40-ft joints of 34-in. OD pipe were double jointed in the yards. First, they were shield arc-welded with the stringer bead and two hot passes manually applied. Then, automatic welding equipment ran two hot passes to finish the yard welding. Resulting 80-ft joints were then coated and wrapped with a special coal-tar based, plasticized enamel made to Gas Supply's specifications by Barrett Div., Allied Chemical Corp. A glass-fiber inner wrap, and an outer wrap of Johns-Manville 15-lb saturated pipeline felt and kraft paper finished the protective coating.

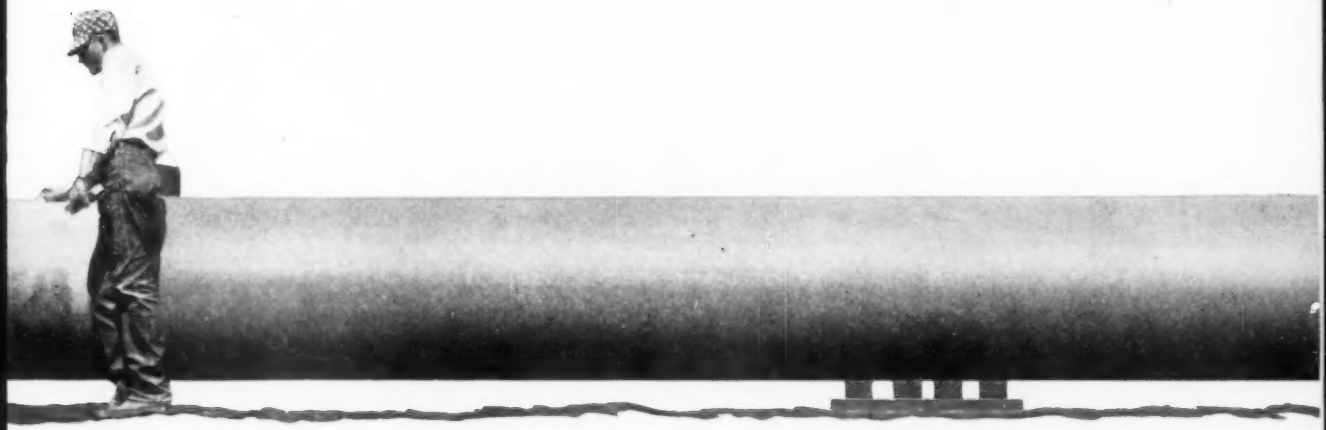
Engineers Ltd. Pipeline Co. (San Francisco) did the spreadwork on this pipe. After stringing, the 80-ft joints were lowered into the trench, and welded in place. Bellholes were excavated at 80-ft intervals to provide welders' working space. PLGS specifications



One of the block valves equipped with automatic operators on the new PLGS 34-in. line.

LINE PIPE to 42 in.





BETHLEHEM STEEL LINE PIPE—now produced to 42 inches OD—is manufactured to the specifications shown below.

	SIZES (in., OD)	WALL THICKNESSES (in.)	LENGTHS	SPECIFICATIONS
HYDRAULICALLY EXPANDED ELECTRIC FUSION-WELD (submerged arc)	22 and 24 26 through 36 36 through 42 ①	¼ to .0438 incl. ¼ to ⅜ incl. ① ¼ to ¾ incl. ①	40-ft ②	API 5LX, Grades X42, X46, X52 & X56 ①
ELECTRIC RESISTANCE-WELD	5 (nom) to 16	Standard & Extra Strong	to 60-ft	API 5L, Grades A & B API 5LX, Grades X42 & X46
CONTINUOUS BUTT-WELD	½ to 4 (nom)	Standard & Extra Strong	21-ft, ±1-in. ③	API 5L, ASTM 120; ASTM 53
COMPRESSOR STATION PIPE	in diameters, thicknesses, and lengths as required; fabricated from as-rolled, high-strength Mayari R steel; made in accordance with Sec. 8 of ASA B 31. 21.8—1955.			

① For sizes, thicknesses, and physical properties exceeding present API 5LX specifications, official API monogram cannot be applied.
② Expanded after two 20-ft lengths are joined with girth weld. ③ Also available in random lengths.

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BETHLEHEM STEEL

Coming out of Angeles National Forest, Gas Supply's new line bringing additional California-produced gas to the Pacific Lighting distribution systems loses some altitude before entering the San Fernando valley.

called for close alignment and maintenance of the pipe in a fixed position while running the stringer bead and making the first pass.

Richardson X-Ray Service (Alhambra, Calif.) had the contract for radiographic inspection of field welding.

Ten mainline block valves are installed, spaced from a minimum of 5.8 to a maximum of 12 miles. All are equipped with Ledeen Inc. (El Monte, Calif.) quad-type pneumatic valve operators. The control system is designed for automatic valve-closing actuation in case of line blowout, and push-button actuation for opening.

The Tehachapi mountains gave the spreads on the pipeline some rugged terrain—the lair of the backhoe and blasting powder. Engineering and ingenuity at their best are required to take construction through this high, rocky country.

We have seen that there will be more out-of-state gas needed in California in the coming years. Several projects are involved. It will be necessary, though, for Pacific Lighting System to build some additional pipelines.

Pacific Lighting Gas Supply is already scheduled for one of these. This will be the intra-California segment of the Transwestern pipeline now awaiting certification to build a highly automated, 1305-mile, big-inch pipeline system from Texas and other southwestern states to the middle of the Colorado river—the California-Arizona border. This modern, very interesting system is estimated to cost some $190 million, as applied for and if authorized.

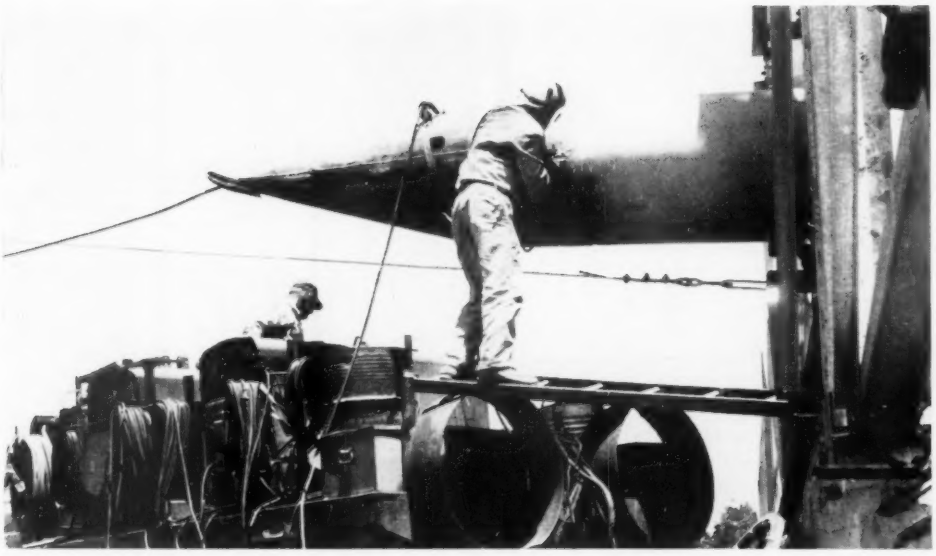
Gas Supply plans its complementing pipeline as 128 miles of 34-in. pipe. A new compressor station at Needles will be required. The line will probably tie in to the existing Needles pipeline near the small town of Newberry, Calif. This project will require approval of California's PUC.

Initial deliveries to southern California will be in the range of 300 to 350 MMcf/day, beginning late in 1959. Pacific Lighting Gas Supply estimates cost of its pipeline and compressor station at $21 million; making a total investment by PLGS and Transwestern of $211 million for the single purpose of supplementing gas supply to southern California consumers.

El Paso Natural also has more gas supply waiting. This company proposes to deliver 400 additional MMcf/day to the Pacific Lighting System companies at the California-Nevada border. For this plan, a 511-mile, 34-in. pipeline between the mentioned point and a connection with Pacific Northwest's pipeline at Twin Falls, Idaho, will be required. Other construction will be needed to effect this delivery.

Westcoast Transmission wants to build 178 miles of 30-in. line to deliver Savanna Creek and Jefferson Lake (both in Alberta, Canada) natural gas to Pacific Northwest at 150 MMcf/day near Kingsgate, B. C. This, in turn, means that Pacific will need to build 123 miles of 30-in. from Kingsgate to its system at a point near Spokane, Wash. And still part of the 400 MMcf/day delivery proposed for the Pacific Lighting companies by the El Paso Natural Twin Falls project will be loopings of Pacific Northwest's 22-in. mainline between the Big Piney fields lateral northward to Twin Falls.

It should be stressed that all of these plans are strictly in the proposed stage. Many certificates, licenses, authorizations and permits from state, fed-



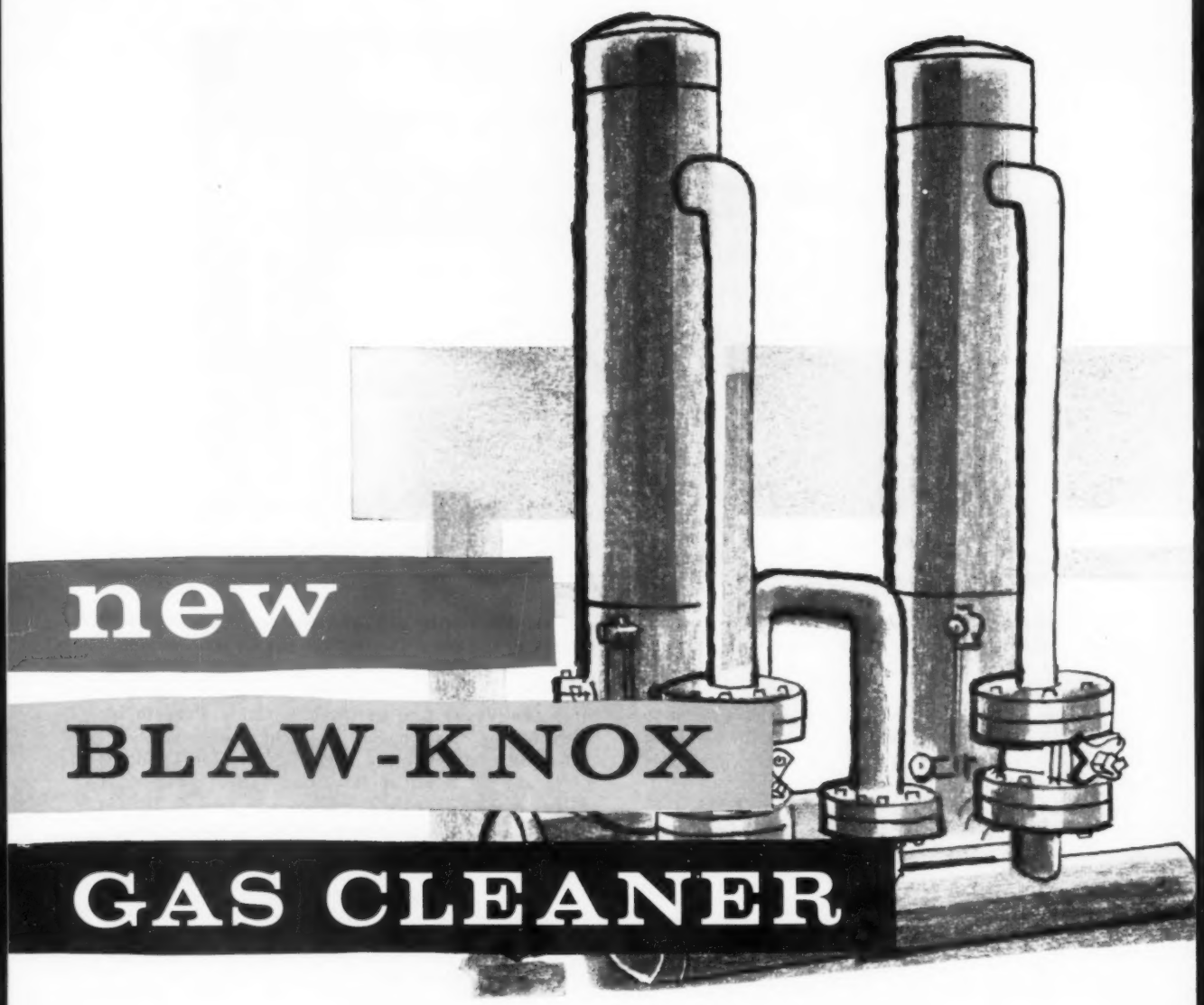
Pulling head is welded on a 34-in. crossing run for an overhead dry-wash crossing.

eral, dominion, and provincial sources have to be obtained before the pieces can fall in place. It should be pointed out, however, that the ultimate capacity of the Twin Falls-California line is designed for delivery of 800 MMcf/day. And these proposals seem to make the most direct and economic plan for bringing excess gas reserves in Canada to their inevitable market in southern California.

The Pacific Lighting System segment of this proposal will swing across the Mojave desert from near Las Vegas—with 34-in. pipe—to a crossover tying in with the existing Needles pipeline near Newberry, where the Pacific Lighting Gas Supply line with Transwestern-delivered gas will also join the Needles system. We (*GAS*) can speculate further and assume that a compressor facility on the crossover would give a lot of flexibility if designed to pump in both directions. Still just thinking, it would be logical to drop the Vegas line in through Cajon Pass to hit metropolitan Los Angeles from the southeast.

A San Francisco-Los Angeles pipeline will be necessary IF a lot of IF's materialize: namely, if PG&E plans to bring Canadian gas into California are realized, if PG&E wishes to make some of the gas available to the Pacific Lighting system, and if Pacific Lighting wishes to take it. The latter can only be determined after the costs and other phases of the project shape up more definitely. ■

Pipelayer-equipped crawler tractor deftly picks up an 80-ft, double-jointed, 34in. OD section of pipe prior to lowering it into the trench for field welding.



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Magnetographic control of pipeline butt welds

Inspection of butt welds on pipelines is a problem that faces engineers throughout the world. Here is a report, written especially for GAS, on what Russia is doing in the realm of magnetographic inspection.

By A. S. FALKEVICH, Engineer
VNIIStroineft, Moscow, USSR

IT was not so very long ago that control of welded transmission pipelines was effected by visual inspection and mechanical bending and tensile tests of specimens selectively cut out of control butt-welds.

In 1948, radioactive isotopes began to be employed for this purpose in the USSR. Gamma radiography made it possible to considerably improve and speed up butt-weld quality control and cut its costs. At the outset, ampules of radioactive cobalt (Co-60) with an activity of 0.3-0.5 g.equiv. were used. During the past few years isotopes of iridium (Ir-192), cesium (Sc-134 and Cs-137) and europeum (Eu-152 and Eu-154), which possess soft radiation and make it possible to obtain much better image contrast, have found application. To speed up the gamma-raying process, ampules of isotopes with an activity of 2.0-2.5 g. equiv. are used.

However, it should be pointed out that, along with a number of advantages, gamma radiography also has some serious shortcomings that prevent it from being employed for continuous testing of pipeline butt-welds. It involves a lot of work and presents a certain danger to the personnel.

In 1954-1955, a magnetographic method of control was developed at VNIIStorineft (USSR Oil Construction Research Institute). This method consists essentially in recording the stray fields that arise at the flaw spots in the magnetized welding zone on the ferromagnetic tape and passing the latter through reproducing magnetic head. The current arising at this stage in the head windings is fed through an amplifier to a cathode-ray tube and causes the ray to deflect.

From the amplitude of deflection of the ray and length of the impulses on the ray screen, one can judge of the nature and size of any defects in the welded seam. To facilitate the control, a neon tube with a given threshold of lighting, that lights up only when there are intolerable defects in the seam, is included into the cathode-ray tube circuit. The ferromagnetic tape employed to record the defects is of the same type as that used in sound recording, only wider: it is 35 mm in width.

The control process consists of two consecutive operations: magnetization, i.e., "recording," and re-

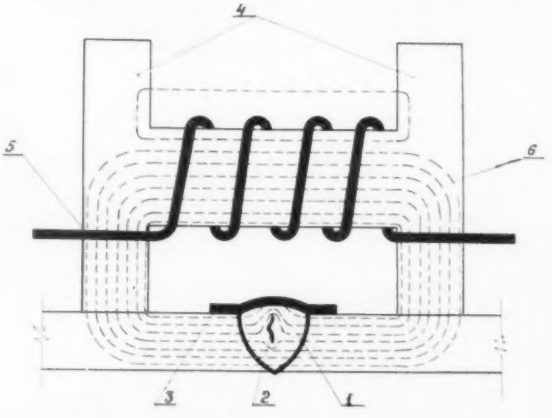

Fig. 1. Diagram of magnetization by a disc magnet. 1. welded seam; 2. flaw; 3. ferromagnetic tape; 4. poles of the magnet; 5. magnet winding; 6. magnetic flow.

GAS exclusive

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Precision Press Forgings (as well as Hammer Forgings and Extrusions) are made in quantity on a production basis as missile, rocket and engine components, heavy machinery parts, etc. This 64¾" OD x 1½" wall thickness press-forged stainless steel part is a Heat Sink for a long range missile.

TAYLOR

This 42" OD x 16" long Stainless Steel Jet Engine Turbine Case is representative of products formed by Taylor Forge ring rolling methods. Seamless rings are made in sizes to 120" OD with practically any required section.

Forged Headers with contoured outlets, made with any required outlet arrangement, are widely used for valve settings, gas compressor station manifolds, scraper traps, refinery charge heater headers, and many other applications in gas, oil and process piping. They are also made in heavy wall thicknesses for high pressure-temperature central power station service.

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Taylor Forge was America's first and is still the foremost manufacturer of Welding Necks, Nozzles, Large Diameter Flanges and similar boiler, heat exchanger and other pressure vessel components. Such parts are made in any size and material for any service condition.

Spiral-Weld Pipe, our original product, (first made as spiral riveted pipe nearly 60 years ago), remains to this day a major item and its use continues to expand. Its money saving features are widely recognized in services such as gas gathering lines; gas, oil and water well casing; irrigation pipe; water piping in sand, gravel and mining operations; and in fact, wherever the use of light weight pipe is indicated. It is also widely used as pipe piling.

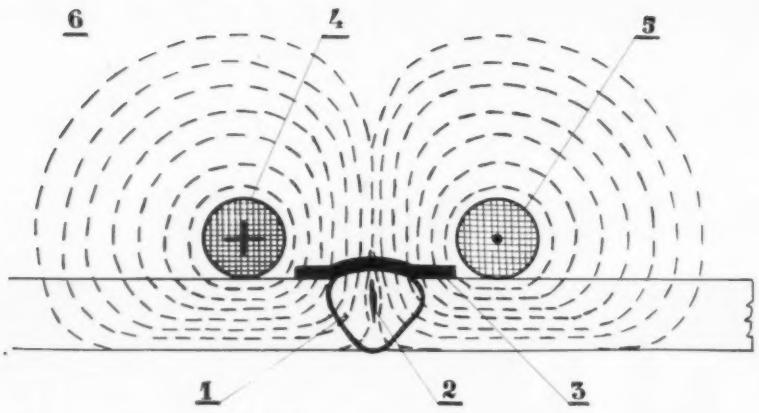


Fig. 2. Diagram of magnetizing device of the solenoid type: 1. welded seam; 2. flaw; 3. ferro-magnetic tape; 4 and 5. solenoid windings; 6. magnetic flow.

production or "reading." With the help of a special erase head, the tape is preliminarily demagnetized. A tape thus treated is placed on the butt-weld to be checked and pressed down tightly to its surface with a rubber band.

The magnetization is done with the help of a disc magnet or a multiple-turn solenoid. In the first case (*Fig. 1*), the electromagnet consists of two discs, which play the role of poles. The coils are wound around the axis of the magnet. The disc magnet may be fed from a 24-v accumulator, a rectifier or a welding generator. When the magnet is rolled upon the pipe surface, it gives rise to a magnetic flow in the butt-weld zone between the discs that goes through the welded seam at the right angle. With a flow value close to magnetic saturation and provided that voids are present in the welded seam, the stray flux that forms above the defect emerges to the surface and is "recorded" on the ferromagnetic tape. The disc magnets are of relatively small weight (4-9 kg.) and are convenient enough in field and factory conditions.

In the second case (*Fig. 2*), the magnetization is done with the help of a multiple-turn flexible solenoid that embraces the pipe and is fed from a condenser with a discharger. When the condenser is switched on, a heavy current is built up in the solenoid, which causes the appearance in the weld zone of a magnetic flow normal to the pipe wall. This method of magnetization is simple enough, does not require cumbersome equipment, and is convenient to employ in field conditions. At the same time, when there are appreciable welded influxes on individual sectors of a seam, impulse magnetization may lead to the recording on the tape of "false" flaws.

The reproduction, i.e. "reading," of the tapes is done with the help of magnetographic flaw detectors. One of the most widely used here, the VUMD-3 (*Fig. 3*), consists of a tape-conveying and an electronic unit with an amplifier, a cathode-ray tube, a high-frequency generator for feeding the erase head, and a flaw indicator in the form of a neon lamp.

To play back the recording, the ferromagnetic tape is placed in the moving carriage of the tape-conveying unit and is drawn past the stationary head at a speed of 36 mm a second. At this speed, only 30 seconds are needed to reproduce the defects recorded on a tape one meter long. The electromotive force which is formed in the reproducing magnetic head is amplified by an electronic amplifier and fed to the cathode-ray tube, causing the ray to deflect.

The ferromagnetic tape may be used repeatedly. It has only to be drawn through a special erase head

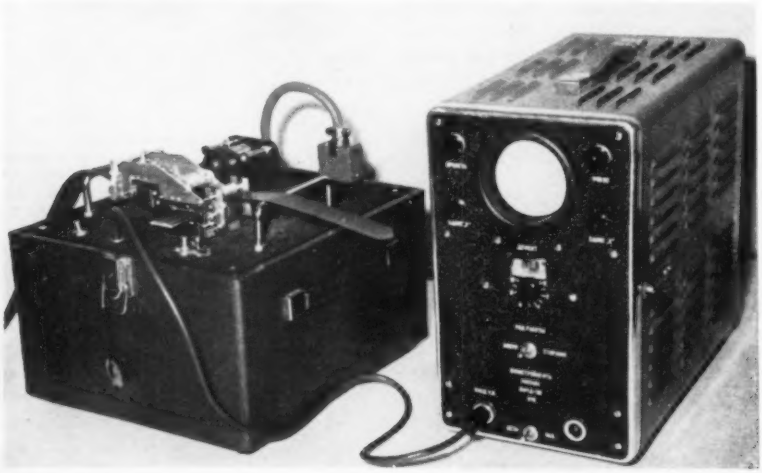
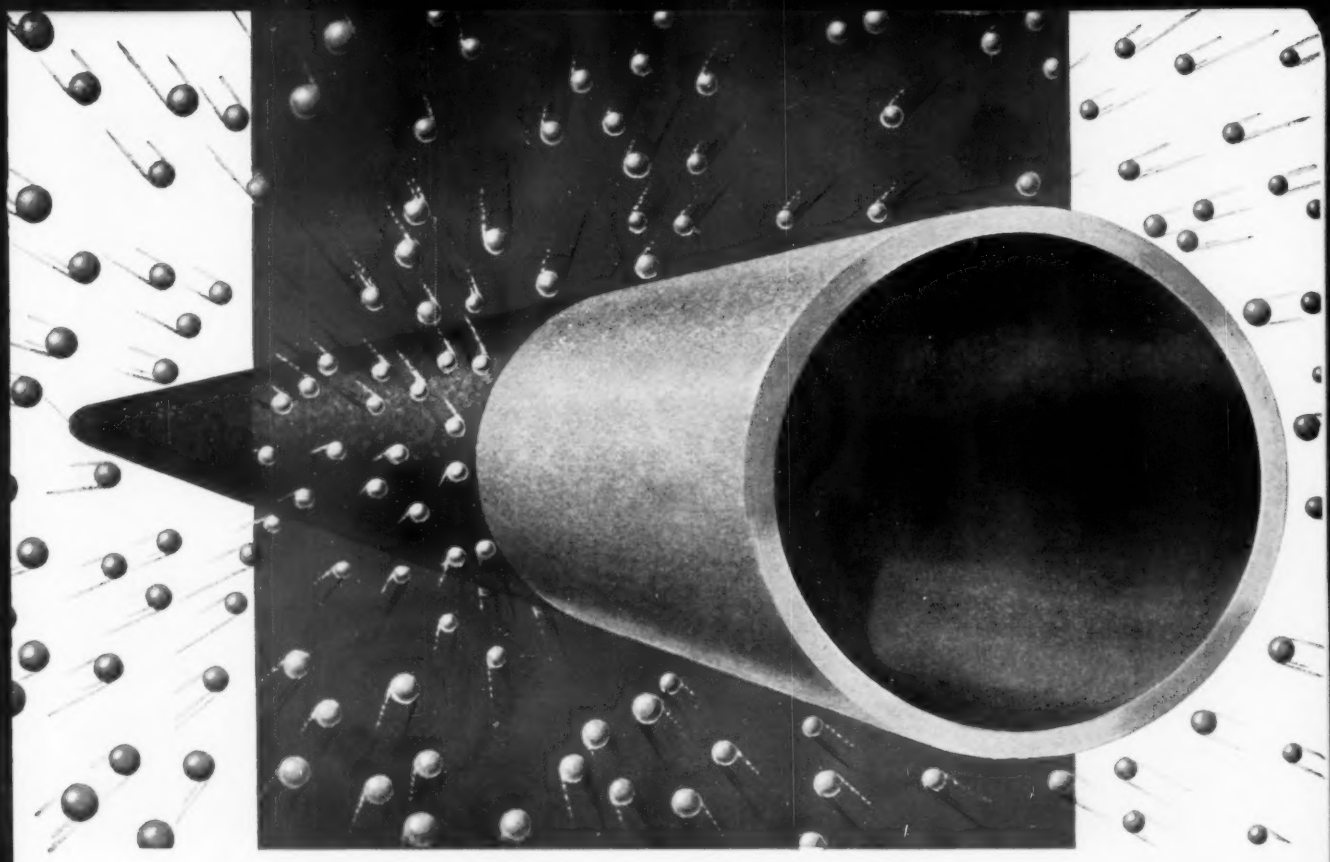


Fig. 3. Reproducing device of the magnetographic flaw detector.



Steel Shot Cleaning makes Pipe Protection Stay Put

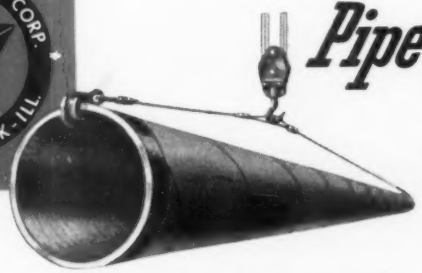
Applying protective coatings to improperly prepared pipe surface makes about as much sense as building a skyscraper on sand. Pipe Line Service has always pioneered in developing new ways to insure a good bond . . . a bond that makes protective coatings practically inseparable from the pipe itself.

An outstanding example is steel shot cleaning. Special machines permit bombardment of the pipe surface with millions of steel pellets traveling at high speed. Result? Not simply removal of mill scale and rust . . . but actually an "etching" of the steel surface. This slightly roughened surface allows the protective coating to "take root"—gives you the years of protection that you should have.

We emphasize Pipe Line's steel shot cleaning process because it was one of the great steps forward in maximum protection of *your* pipe investment. It's a manufacturing extra that's provided at no extra cost . . . and one more reason for extra confidence in specifying protection by PLS!

PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK, ILL.

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES



Pipe Line Service Corporation

General Offices and Plant: Franklin Park, Ill.

Quality pioneers in coating and wrapping pipe for over a quarter century

Plants also at: Monmouth Junction, N. J.; Glenwillard, Pa.; Sparrows Point, Md.; Longview, Tex.; Corpus Christi, Tex.; Provo, Utah; Harvey, La.

Sales offices at all plant locations . . . and Atlanta, Ga.; Houston, Tex.; Lincoln, Nebr.; Tulsa, Okla.

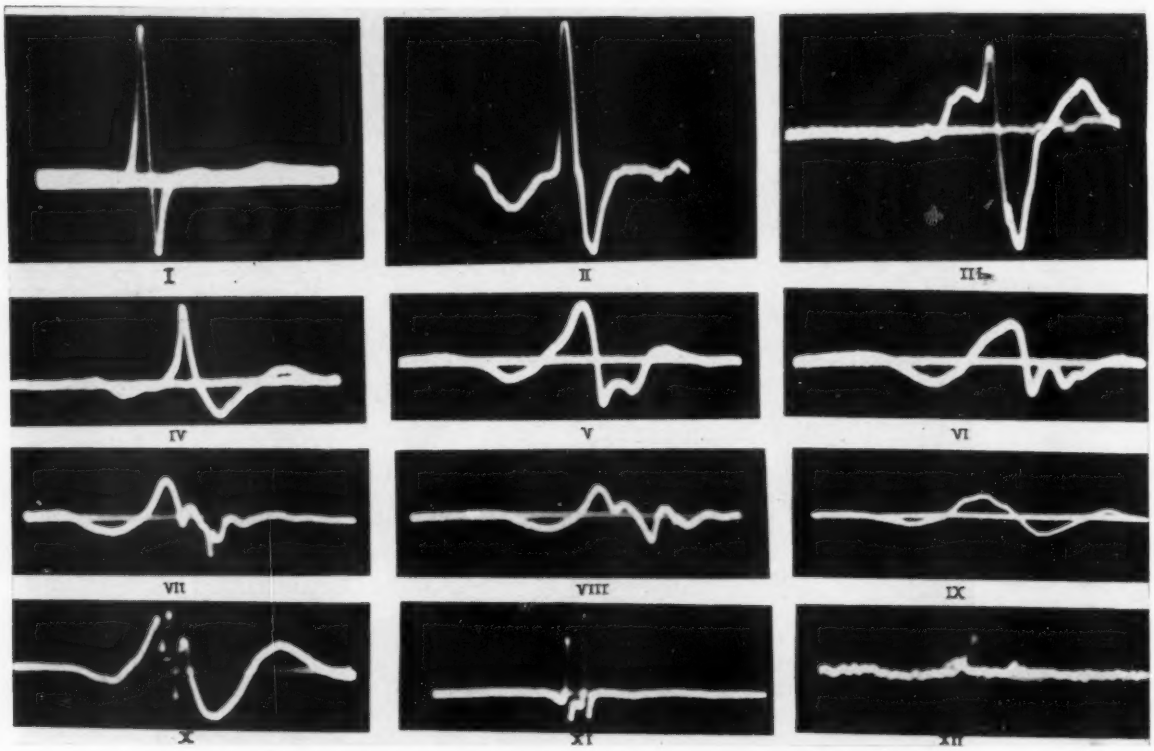


Fig. 4. Impulses arising when various recorded seam flaws are played back.

after it has been played back.

Magnetographic flaw detectors may be of stationary or mobile types. It is the latter, mounted in a special towable mobile laboratory, which is used to control transmission line butt-welds.

Comparative studies of the sensitivity of the magnetographic X-ray and gamma-ray control methods have shown that, for sheet and pipe wall thicknesses ranging from 4 to 12 mm, all three methods give approximately the same results.

Magnetographic flaw detectors are good at revealing longitudinal microcracks of any width, slag inclusions and accumulations of blowholes in a welded joint. They are much worse at bringing to light transverse cracks that coincide in direction with the magnetic flow, separate blowholes and rounded slag inclusions.

With a view to facilitate the process of magnetographic control, a study was made of the shapes of the impulses appearing on the screen of the cathode-ray tube when tapes with flaws of different types were played back. It was established that longitudinal cracks give sharp-pointed impulses of appreciable amplitude and comparatively short duration (*Fig. 4-I and II*). The presence of points of poor penetration in welded joint is characterized by more gently rising impulses, whose amplitude depends upon the depth of the point of poor penetration (*Fig. 4-III-IX*). The presence of blowholes is detected by the single outsplashes of the maxima and minima of sharp-pointed impulses (*Fig. 4-X-XII*). Displacement of the edges of pipes or sheets gives the same type of impulses as poor penetration, but in this case they rise more gently (*Fig. 4-IX*).

In the course of 1955-1957 the magnetographic method was widely used to quality control the welding during the construction of Stavropol-Moscow long distance gas transmission line, and also a number of others. On many sections of this pipeline, no less than 10 per cent of the butt-welds made by each operator were quality controlled. If intolerable flaws were detected in at least one of them, 25 per cent were then quality controlled, and if such defects were detected once again, all 100 per cent were quality controlled. Furthermore, 100 per cent quality control was the rule at all points where the pipeline crossed rivers, swamps, railways and highways.

A large number of the butt-welds were simultaneously inspected by gamma-rays. A comparison of the data obtained confirmed the laboratory findings that both control methods were practically equally sensitive.

It took 7 to 8 minutes all told to quality check a 720-mm OD pipe butt-weld by the magnetographic method. A quality inspector and his assistant operating a magnetographic flaw detector checked as many as 50 butt-welds per shift while only 7 to 8 butt-welds could be gamma-rayed in this time.

VNIIStroineft is now working to further improve the magnetographic method. The immediate goals are to replace the ferromagnetic tape manufactured on a cellulose base by tapes made of more durable materials, and to obtain visible images of the defects recorded on the magnetic tape. ■

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As a basic producer, Pittsburgh maintains rigid quality control standards at every step of enamel production, from coal to finished coating.
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Pitt Chem sales representatives are experienced coating men. They talk your language, will help you plan the many requirements of your coating job.
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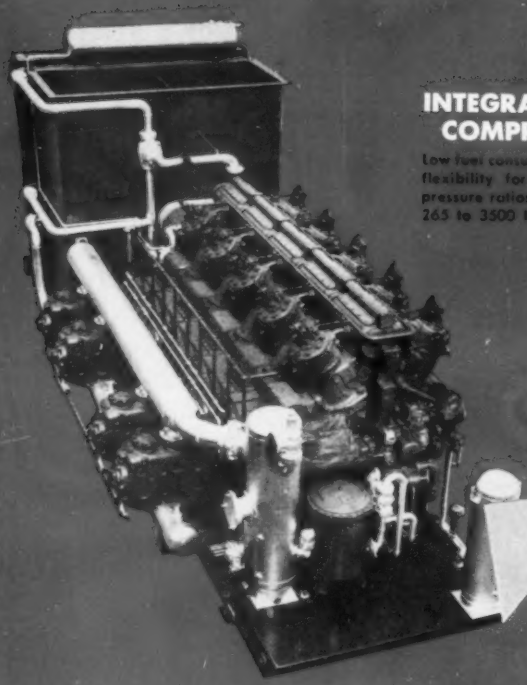

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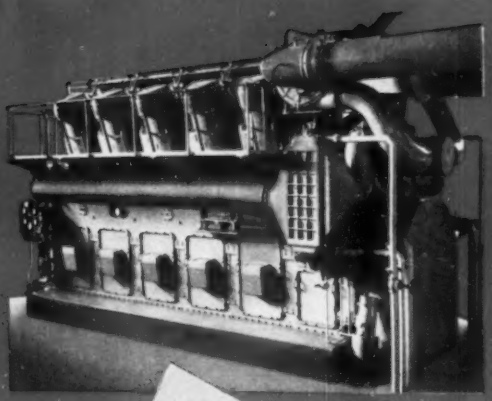
Low fuel consumption, compact, flexibility for widely varying pressure ratios. Available from 265 to 3500 hp.



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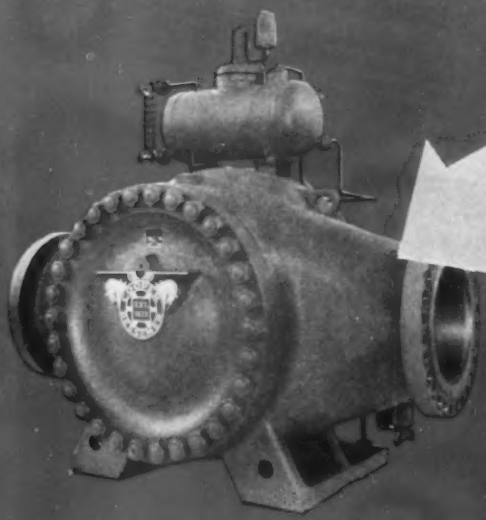

CENTRIFUGAL COMPRESSORS

Adaptable to engine, motor or turbine drives. Highest efficiency. Minimum maintenance, compact design. Available from 1000 to 15,000 hp.

ENGINE DRIVEN COMPRESSORS

Long term dependability, low maintenance, optimum fuel economy. Available from 500 to 5000 hp.

- **DESIGN RANGE**
- **ADAPTABILITY**
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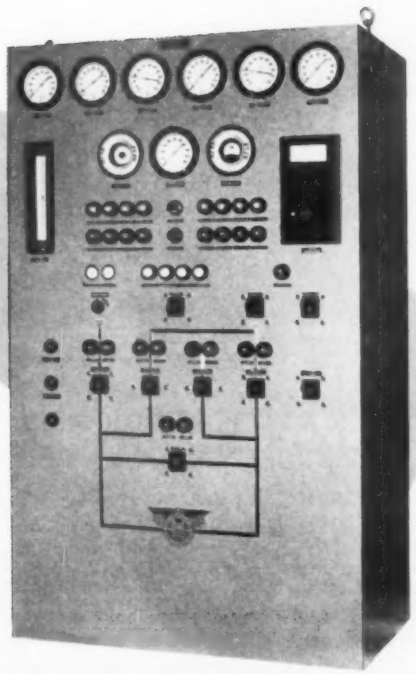
COOPER-BESSEMER

ideally meets today's *new* compressor and control requirements in gas pipeline services



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For any control function or combination, including completely integrated system automation . . . Cooper-Bessemer En-Tronic equipment offers simplified responsibility, higher dependability and greater operational economy.

Select the Cooper-Bessemer combination best suited to economically and efficiently meet specific gas transmission, pick up, storage or recycle requirements.

Contact the nearest Cooper-Bessemer branch office for information about new developments from one of America's oldest engine and compressor builders.

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COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

Pipeline People

N. D. Holman
NGPL

James Rachick
NGPL

E. J. Jandacek
Texas Gas

Robert Spears
Clark Bros.

Richard Jenkins
Clark Bros.

N. D. HOLMAN, superintendent of the insurance division of Natural Gas Pipeline Co. of America and affiliates, Chicago, has retired after 28 years of service with the company. He is succeeded by JAMES W. RACHICK, former assistant superintendent of the division. Mr. Holman was one of the first employees of NGPL, joining Continental Construction Co. which later became NGPL in 1930. Mr. Holman is joining the Houston Texas Gas & Oil Corp., St. Petersburg, Fla., as a consultant. Mr. Rachick, with the company since 1950, was named assistant superintendent of the division in 1956.

E. J. JANDACEK is the newly appointed chief engineer for Texas Gas Transmission Corp., Owensboro, Ky. Texas Gas Vice President H. L. Stowers has served in the dual capacity of vice president and chief engineer since 1957. Mr. Jandacek has been assistant chief engineer since he joined the company's engineering staff in 1949.

R. G. STRONG, director of engineering at Natural Gas Pipeline Co. of America, Chicago, has retired after 28 years' service with the company. He will continue to represent NGPL during the next year at API and AGA committee meetings, organizations in which he has been active for more than 30 years.

D. MICHAEL CURRAN has been appointed senior vice president of Williams Brothers, Tulsa. In 1946 Mr. Curran joined with M. J. Crose to found the M. J. Crose Manufacturing Co., manufacturer of pipeline construction equipment. In 1956 the company was sold to Graham-Paige, but Mr. Curran continued as president of the company, as well as consultant on various pipeline projects.

H. E. LORE has been appointed manager of the engineering and construction department of the machinery division of Dravo Corp., Pittsburgh. Mr. Lore, with Dravo since 1936, has been operations manager of the department since 1955.

LOUIS G. JAMES, WILLARD G. WIEGEL and CARL M. HILL are new directors of Lone Star Producing Co., Dallas. Each is an officer of Lone Star Gas Co., the parent company, and of the producing company.

Two new assistant general sales managers have been named by Clark Bros. Co., one of the Dresser Industries located in Olean, N. Y. Taking over the newly created post in the eastern district offices is ROBERT J. SPEARS. He will supervise the company's offices in Boston, New York, Philadelphia, Detroit, Pittsburgh, Chicago and Atlanta. He is succeeded as manager of the New York district office by RALPH C. MCDONALD, until recently manager of Clark's Philadelphia office. RICHARD E. JENKINS is assistant general sales manager of the area west of the Mississippi River, including offices in Los Angeles, Tulsa and Houston. Mr. Jenkins, who joined Clark in 1948, specialized in sales engineering in Los Angeles for several years before he returned to Olean in 1956 as administrative sales manager.

Midwest Piping Co., Inc., St. Louis, has reopened its sales offices in Atlanta and Tulsa. JOHN CASTLEMAN heads the Atlanta operation while CLAUDE L. DOUGHMAN is in Tulsa. Two new sales representatives have joined Midwest. They are C. B. MOORE, for many years with the Jones & Laughlin Supply Division in Houston, and CECIL HILLIARD, formerly with Republic Supply. Both will headquarter in the Houston office.

D. H. HUSHION, assistant chief engineer for Alberta Gas Trunk Line Co., Ltd., Calgary, has been promoted to chief engineer. He succeeds ELDON V. HUNT, who has served as chief engineer of Trunk Line since its beginning and who recently was named general superintendent in charge of all operations.

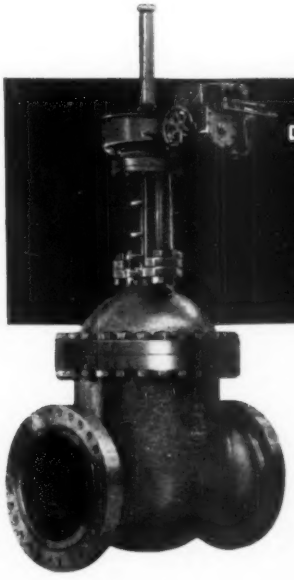
FRED J. BLUM has been elected executive vice president and secretary of Midwest Piping Co., St. Louis. Mr. Blum, with the company for 38 years, was formerly vice president and secretary.

ROBERT S. BOYD has been named manager of the appraisal division of Stone & Webster Engineering Corp., New York. He joined the company in 1956 as an appraisal engineer.

Check this DARLING gate valve trio for

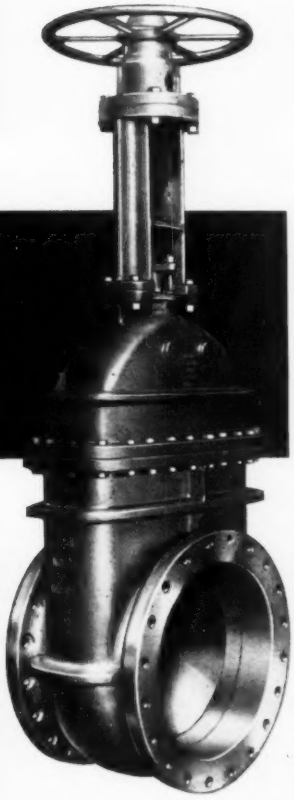
UNMATCHED ADVANTAGES

in every oil, gas and petrochemical service



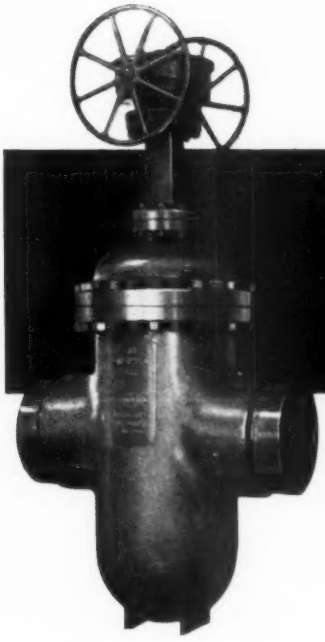
DARLING FULLY REVOLVING DOUBLE DISC GATE VALVES

—famous for *consistently* trouble-free operation in all kinds of service. Revolving disc principle assures easy operation, surer closure, minimum friction, automatic seating compensation, extreme life with minimum maintenance. Ask for Catalog 57.



DARLING ALUMINUM ALLOY GATE VALVES

—featuring all the advantages of the above revolving disc principle, *plus* new economies in the handling of "problem" fluids and gases or wherever aluminum piping is used. Ask for Bulletin SLS 5801.



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—the *only* conduit gate valve with *sealant gasketing* between gates and seats. Every closure leakproof! This and other advantages proved by outstanding performance on major lines. Get *all* the facts. Ask for Catalog 57.

Whatever the service, in any phase of pipelining, gathering or processing, these Darling gate valves offer worthwhile features and advantages unobtainable in other valves. The catalogs referred to above are available to give you the pertinent facts.

DARLING VALVE & MANUFACTURING CO.

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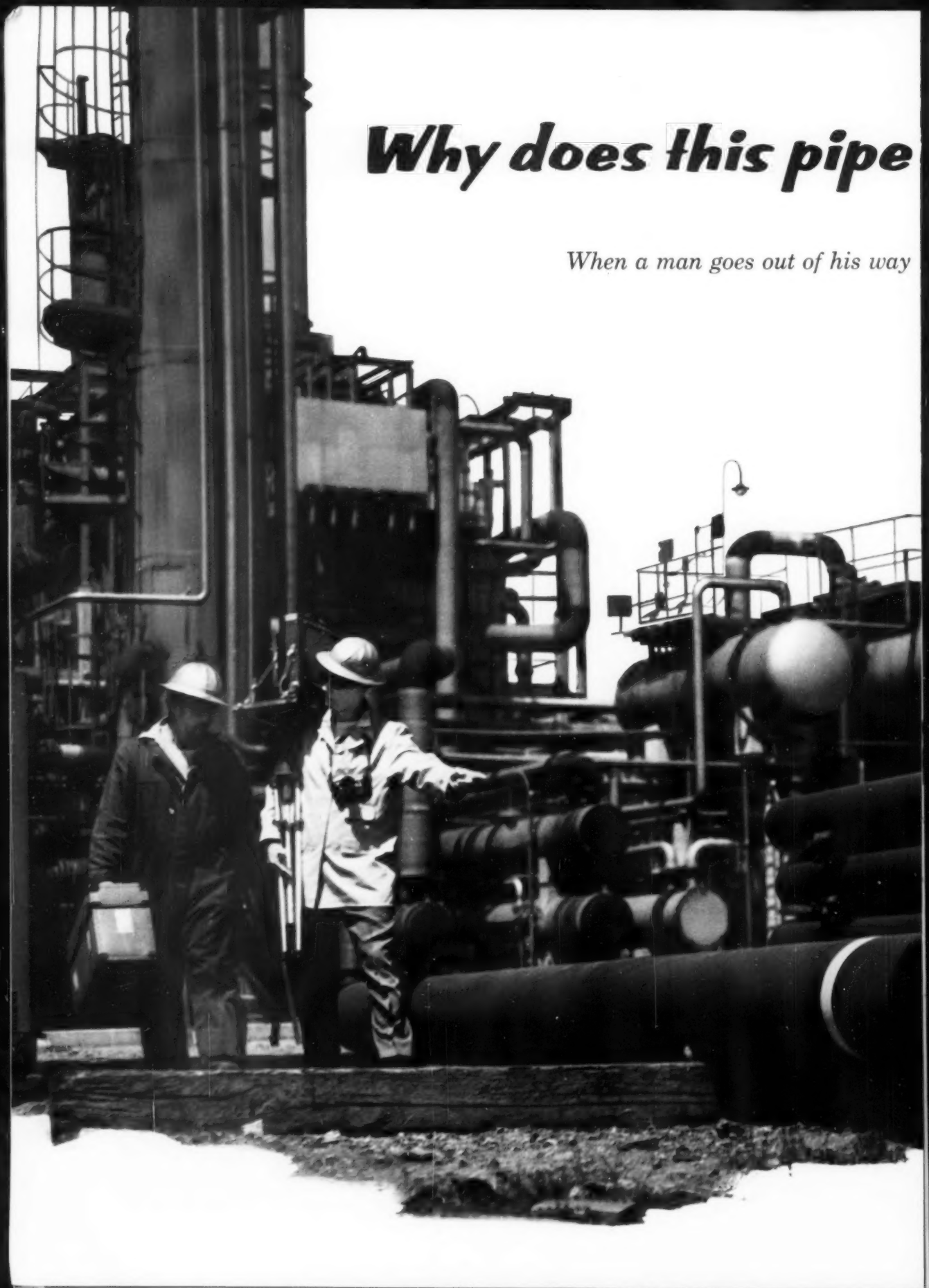
VALVES



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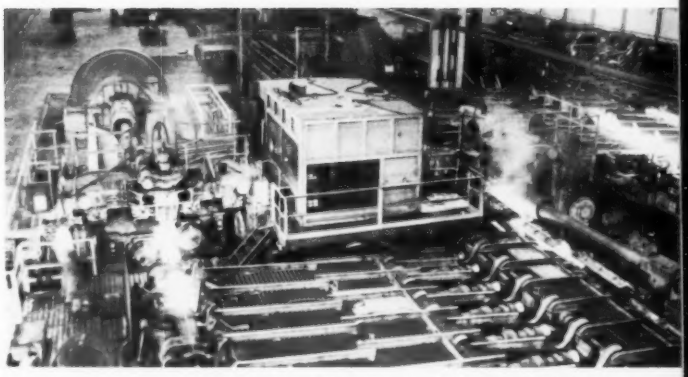
When a man goes out of his way

have an Orange Band?

to make a superior product...

he likes to brand it. This lets people know the quality they're getting. The orange band marks Youngstown seamless line pipe . . . the finest made. This high-strength, uniform quality seamless pipe is furnished with ends threaded, grooved, or plain end bevelled for welding and for various mechanical couplers. To obtain more information about Youngstown Line Pipe, contact our sales and service offices throughout the oil and gas-producing country. *The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.*



Youngstown's ultra-modern, fully-automated No. 3 Seamless Mill—now operating at our Indiana Harbor Works near Chicago—produces the pipe with the orange bands, the finest made anywhere. Illustrated is the piercing operation at which point a hole is formed in the middle of a solid round steel billet. This is an important step in the making of seamless line pipe . . . one of many accurate Youngstown operations that build quality and dependability into the pipe with the orange bands.

QUALITY YOUNGSTOWN SERVICE

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SEAMLESS LINE PIPE

2 WAY PROTECTION

AGAINST SERVICE STOPPAGE, COSTLY PIPELINE REPAIRS

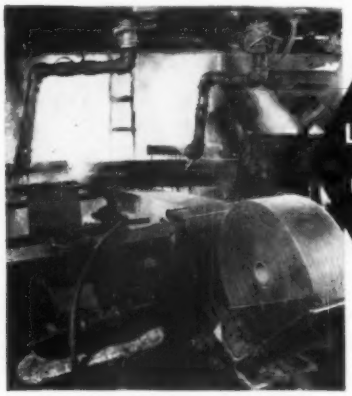
DURATAPE is especially designed for hot-wrapping by hand. Simply spiral-wrap around pipe joint and lightly flash with a butane torch during and after the wrapping operation.

Steel pipelines are often the very "lifeline" of production. When production lines are stopped because of a pipeline failure, losses are incurred.

Your investment in the serviceability of underground pipelines deserves the best protection possible—the kind of TWO-WAY protection you get from L·O·F Glass Fibers' *Duratape* and *Blue Flag*.

A mesh fabric woven of inorganic glass fiber yarn for extra strength and durability and heavily coated on both sides with coal tar or asphalt, *Duratape* protects field joints and fittings by forming a tough, high-dielectric barrier against corrosion.

Application is fast and easy. Pliable *Duratape* conforms smoothly to irregular contours and provides an extremely tight bond because of its compatibility with primers customarily used in pipeline work.



Specify Blue Flag glass fiber Pipe Wrap and Duramat Outer Wrap on all of your mill-wrapped pipe to help guard against underground corrosion.

For fast installation and long service—USE MILL·WRAPPED PIPE

Investigate the benefits of mill-wrapped pipe with coating reinforced by *Blue Flag*, the porous mat made from fibers of special inert glass, which resists the destructive action of soil chemicals. Used to strengthen enamel coating on underground pipelines, *Blue Flag* protects against cracking and backfill damage . . . preserves the pipeline for years beyond its normal life for less than ½ of 1% of its initial cost.

For complete information on how L·O·F Glass Fibers' Pipe Wrap Products can help protect your pipeline investment, write: *L·O·F Glass Fibers Company, Dept. 74-88, 1810 Madison Ave., Toledo 1, Ohio.*

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In the spots that count... Homestead® Valves are

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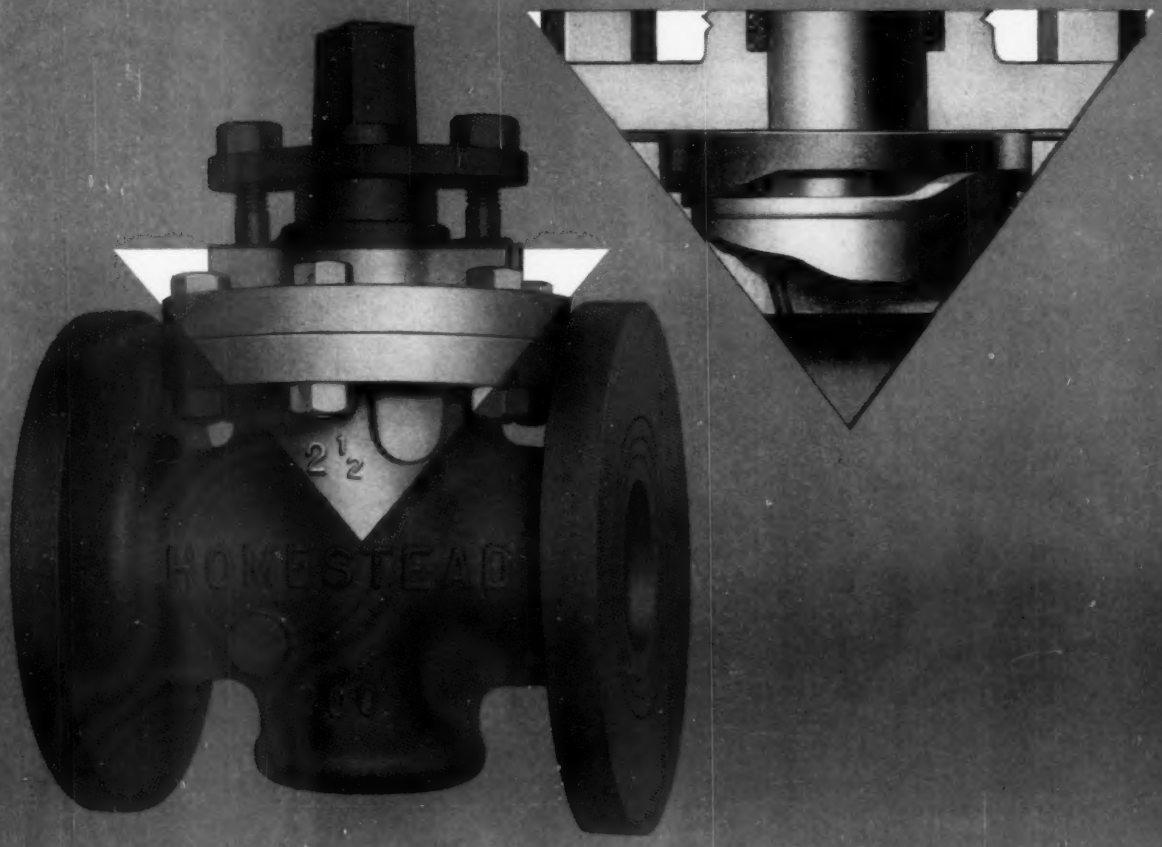

FASTER FLUID CONTROL is guaranteed by the quarter-turn action that fully opens or closes Homestead Cam-Seald Valves. A cam limits plug travel and automatically presses the matched seating surfaces of the plug and body together to form a leakproof, metal-to-metal seal. Additional design features such as the sealed bottom, seal between cap and body, the deep stuffing box, and the fact that fluid or grit cannot pass across the seating surface in the open or closed position, assure long, leak-free service. Write today for complete information—see how Homestead fills your needs.

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HOMESTEAD VALVE MANUFACTURING COMPANY

P. O. Box 405 • Coraopolis, Pa.

pipeline people • *Cont'd.*

Four Texas Eastern Transmission Corp. engineers have been promoted to key posts in the engineering department. CONRAD W. MARVIN, formerly supervising engineer, is now assistant chief engineer; JAY J. BALL is now supervising engineer; GEORGE H. EWING is assistant supervising engineer; and GORDON L. JENNINGS is supervisor of engineering plans and research.

JACK D. TOLLIVER has been promoted to the new post of sales manager for the eastern region of Tube Turns, Louisville, Ky. He will be succeeded as manager of the sales development department by EDWARD F. HARRINGTON. Mr. Tolliver, whose office will be in Louisville, will be responsible for eastern sales operations covered from offices in New York, Philadelphia, Pittsburgh, Chicago, Louisville, and Atlanta.

NEWTON D. BAKER has been appointed to the newly created post of director of employee and public relations for Black, Sivalls & Bryson Inc., Kansas City, Mo. Mr. Baker has been advertising and sales promotion manager since 1951. He will continue in charge of all advertising, promotion and public relations activities and will serve in a staff capacity on employee relations. ARVID H. EDWARDS has been named assistant advertising manager and JOHN H. BOETJER is publications manager. FRANK L. CARDER is production manager for the advertising department.

FRANK W. WALKER has been named a vice president and manager, government sales, by Motorola Communications & Electronics Inc., a wholly owned sales subsidiary of Motorola Inc., Chicago. Mr. Walker will work from Motorola's Washington, D. C. offices. ROBERT L. KRANHOLD succeeds Mr. Walker as West Coast manager.

HEWETT A. GEHRES, retired vice president of the Cooper-Bessemer Corp., Mt. Vernon, Ohio, has been cited for his outstanding contributions to the oil and gas industry over the past 48 years. The citation was made at the annual conference of the Oil & Gas Power Division of the American Society of Mechanical Engineers. At the same meeting, J. D. HINES, chief research engineer, and NELSON REED, designer of rotating machinery for Cooper-Bessemer, received honorary commendation for their work in the oil and gas power industry.

MERLYN M. MCINTURF, chief engineer at Ohio Fuel Gas Co.'s Weaver compressor station for the past five years, has been named southern compressor division superintendent. He succeeds JOHN ADAMS, who has retired. Mr. McInturf will headquarter at Ohio Fuel's Crawford compressor station near Sugar Grove.

ROBERT D. BUTLER has been named assistant to sales manager —plug valves for W-K-M, division of ACF Industries Inc. He will work out of Houston.

A. G. BAILEY has been elected president of Alberta Gas Trunkline Co., Ltd., Calgary. He succeeds VERNON TAYLOR, who resigned.

C. H. MCBRIDE is sales manager for the east Texas-northern Louisiana area for Tubular Lining Corp., Houston. He will headquarter in Shreveport.

DR. SAUL ROSEN has been named to the newly created post of manager, programming research and development for Philco Corp.'s "Transac" computers.

Conrad Marvin
Texas Eastern

Jay Ball
Texas Eastern

George Ewing
Texas Eastern

Gordon Jennings
Texas Eastern

GAS PIPELINE NEWS

Michigan Wisconsin's $19 million plan okayed

The FPC adopted one of its presiding examiner's decisions authorizing Michigan Wisconsin Pipe Line Co., Detroit, to spend $19.4 million on an expansion program to increase its system capacity by 40 MMcf/day (Docket G-13246).

The decision was conditioned, pending final determination, among other matters, of allocation issues, to restrict Michigan Wisconsin from using any of the additional gas supply for firm service or from using the authorized facilities for deliveries to any new customer except upon specific authorization from the commission.

Authorized facilities include about 56 miles of 20-in. laterals from the company's mainline to the Laverne field in Harper County, Okla.; field lines, metering, and appurtenant facilities in Laverne field; nine new mainline compressors with a total of 31,500 hp; additions to four existing compressor stations; and a 20.5-mile loop of its 22-in. line to the Austin storage field in Michigan.

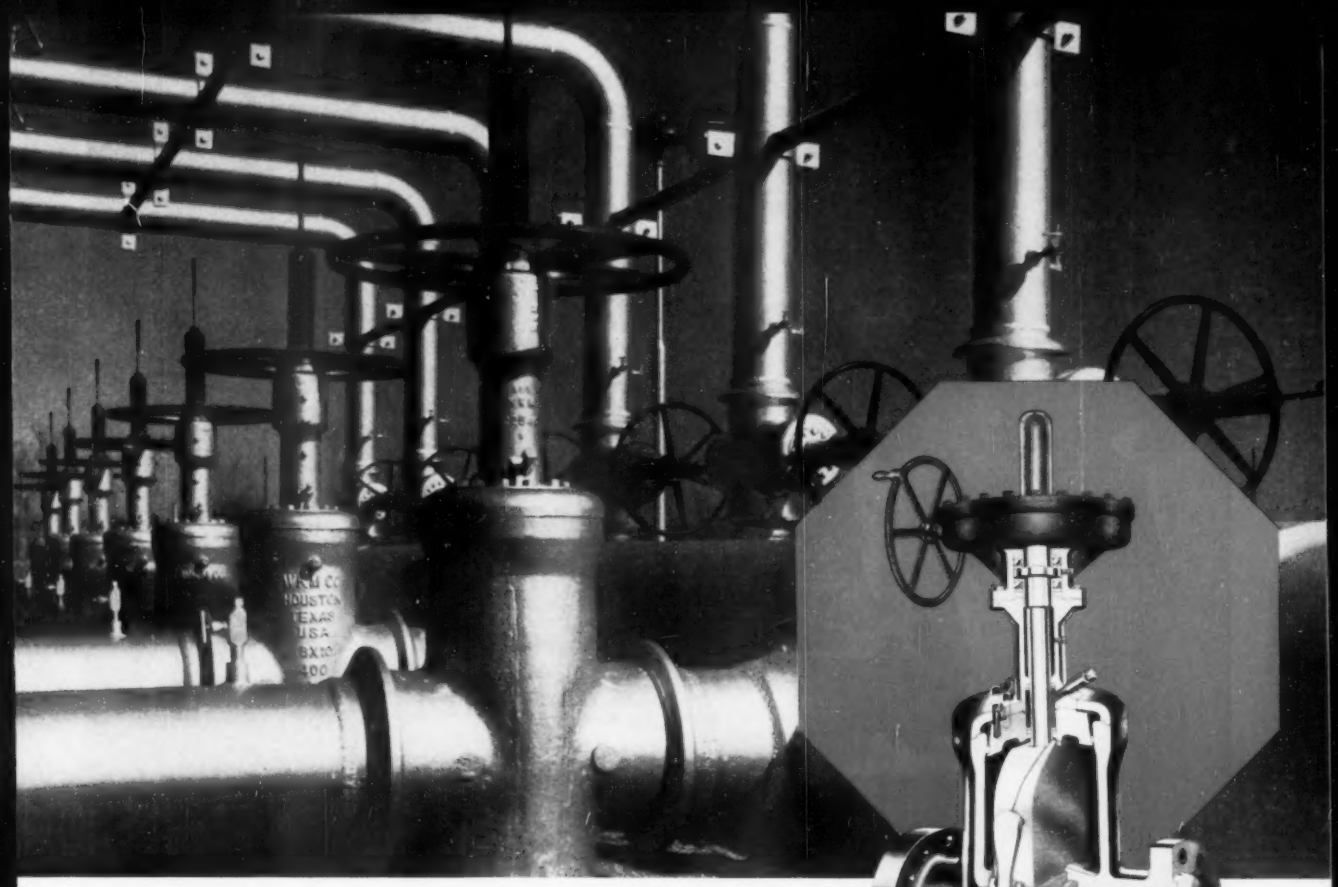
NGPL's major expansion sanctioned by commission

Authorized recently was construction of the biggest increment of pipeline gas supply for customers of the Peoples Gas System since the building in 1951 of the 1200-mile Texas-Illinois pipeline between the Texas Gulf Coast region and the Chicago area.

The FPC okayed Natural Gas Pipeline Co.'s plan covered in Docket G-12399 to construct 490 miles of 36-in. line and 21 miles of 26-in. loops between Fritch, Texas and Joliet, Ill. Also covered in the $81.8-million plan were additional metering facilities near Joliet.

Eskil I. Bjork, chairman of the Peoples Gas Light & Coke Co., said that when construction is completed and FPC authority to operate is received, the additional gas will mean the offering of gas space heating to

Continued on page 142



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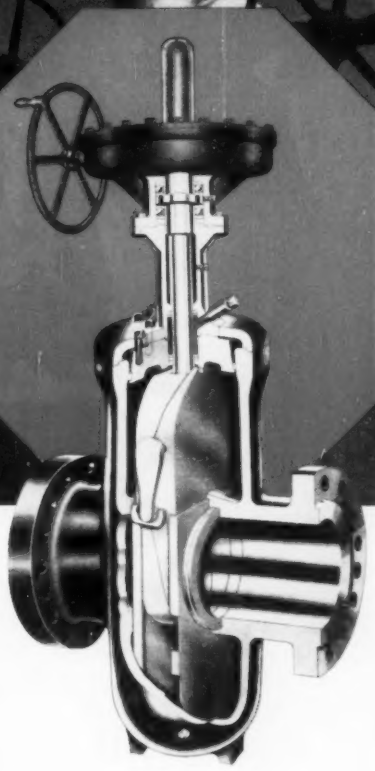

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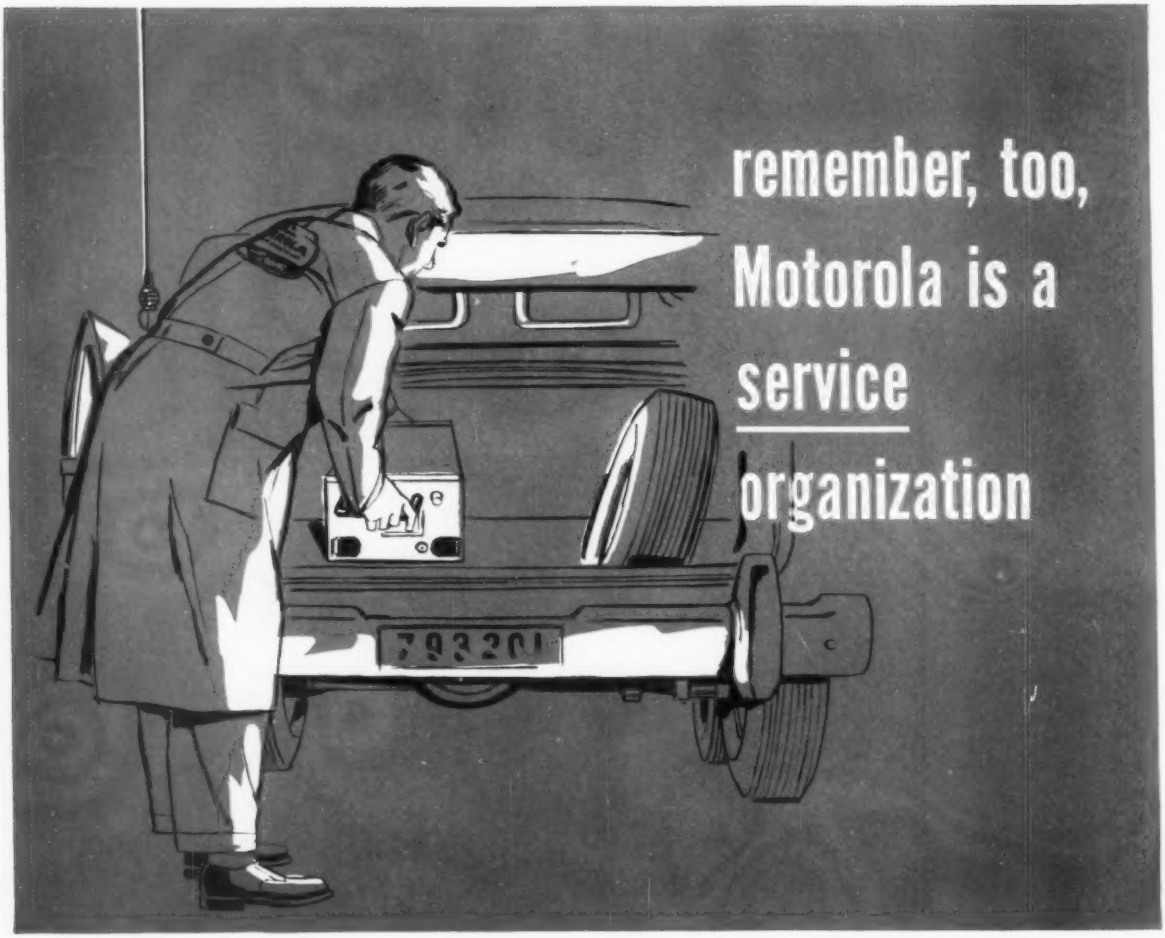

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Edited by FRANK CHAPMAN

Telecontrol communication channels—which is which?

By F. VINTON LONG

I AM quite sure that many members of pipeline management do no fully understand the several choices of communications channels to carry telecontrol intelligence. They don't because that is not their job to know and for that reason I'll try to explain it in one syllable words.

There are definite advantages and disadvantages of these several types of channels. However, it all comes back to the simple premise that you cannot get something for nothing.

It costs money to pipe a channel from here to there that will carry some bit of telecontrol intelligence. There are two methods of piping this telecontrol intelligence from point A to point B. One method would employ the use of privately owned microwave. If sufficient need is involved and the microwave system is there, then we need go no further. It is just about as easy to transmit a wide band or telephone type channel on a privately owned microwave system as it is to multiplex a telephone type channel to provide several signaling channels or narrow band channels. So if you have or contemplate a privately owned microwave system, you should probably read no further because this does not apply to those people.

However, it does apply to the people who have nothing at all at present. They have to decide what kind of communication channel to use for transmitting their telecontrol intelligence back and forth to take charge of the pump and compressor stations involved in a pipeline, or the valves, or other things which have to be controlled.

There are actually three types of channels concerned if you wish to lease them from the common carrier. As I have said before, this does not apply if you have your own microwave system. But if you do not, and you are starting from scratch and want to compare the available systems, then you should take all three into consideration.

One is the so-called signaling channel with a band of 15 cycles a second. This is adaptable for several pieces of supervisory control equipment and definitely so for the slow-speed telemetering apparatus. This channel is the cheapest of all, and on long line common carrier will probably cost the basic rate of 75 cents a mile a month plus tax. On intrastate service it will probably be at least double or triple this amount.

Next on the list, going higher in cost, will be the teletype grade channel which has a maximum frequency rate of about 35 cycles per second. This will carry some of the higher speed telemetering circuits and teletype circuits. They are used quite a bit throughout the United States and will cost in interstate service a basic charge of $1.50 per mile per month. Again, in intrastate service, it will probably be higher.

The most expensive of the private lines available is the voice quality type circuit which will ordinarily give a band width of about 250 cycles to 3000 cycles, and which will cost in interstate service a basic rate of about $3 per mile per month plus tax.

There is also a program type channel of about 6000 cycles which costs several times any of these mentioned, but it is ordinarily not used in telecontrol operation.

Coming back to my premise that you cannot get something for nothing, I would like to show just what we do get with different type channels. Ordinarily, the slow speed 15-cycle signalling channel is used on what you might call a d-c type operation or a series or loop circuit. It is possible to send out control functions on this slow speed channel. It is also possible to receive slow speed telemetering information. I want to make clear that you can't do both at once because it is essentially a one-way signalling device. You either send out control information or control instructions or you don't, and while you send out this control instruction you do not receive feedback information from the point which you are controlling. This, in some cases, is a serious drawback and in other cases it doesn't matter at all.

The teletype channel is sort of betwixt and between. Right now, as far as pipelines are concerned, it has no special value. It is, of course, used for teletype work, but as far as signalling and intelligence are concerned, it is just not wide enough for complex intelligence information. It requires twice as much money per month as the simple intelligence information provided by the 15-cycle channel, so it really has no use except for teletype transmission.

Going further up the scale cost wise with the ability to transmit a lot of information, we have the full voice period type channel. With this channel we can do quite a few things.

We should realize that the voice

type channel costs in interstate service about $3 per mile per month plus tax, but it provides a frequency range from about 250 to about 3000 cycles. If you figure that each 15-cycle signalling channel costs you 75 cents per mile per month, and you divide 15 cycles into 3000 cycles, it takes very little higher mathematics to understand that it is much cheaper for the user to rent a voice-type circuit. This requires that the user subdivide the channel into 15-cycle channels with his own telemetering and multiplexing equipment. In practice, this means about 15 to 18 15-cycle channels.

In times past, the common carrier would not let you do this, but now they do, and it is a boom to those who have more than one piece of intelligence for transmitting from point A to point B.

Going a bit further, if you take this voice-type channel and specify that it should be four wire (by four wire I mean full duplex operation), then in telecontrol of gas, crude, or products pipelines you get an awful lot of dividends, particularly in gas pipelines.

Remember this, that on long distance, toll or full period voice lines, the common carriers ordinarily use four wire or full duplex operation with no questions asked, without an extra charge because like private microwave systems, that is the way it is built and it costs them money to convert it to two wire operation.

In the case of local service drops from the local exchange into the compressor station involved, four wire operation does cost you more than two wire.

So for the advantage concerned, there is no question but what the customer should specify four wire if he uses feedback techniques, and I am amazed that this has not been done before now. I am more amazed that I did not do it myself!

In fact, this has not been done even on private microwave services where it is more expensive to use two wire than four wire operation. Apparently it is a case of nonknowledge of what is available at a cheap or less than nominal price.

Once you have four wire operation on a telephone type channel, you can do all kinds of things with it. You can send out telecontrol signals while simultaneously you can have telemetering intelligence coming back. You can have full closed loop control. You can use the art of cybernetics in which you transmit continuous instructions which are dependent on continuous feedback intelligence.

Very few people know what the difference is between two wire and four wire operation or simplex and full duplex operation. We don't know because it hasn't come up before, so no one is to blame.

To try to sum the thing up, here is what I would do if I were building a gas pipeline. If this gas pipeline needs maximum intelligence for telecontrol, and if I leased the service from a common carrier, I would specify full duplex which would cost probably 25 or 30 per cent more.

If I were to install my own microwave system, I would specify this to the microwave supplier, and it should not cost any more. In fact, it should cost less.

If I were engineering a very simple system such as a crude line or products line with a few small pumps and nothing very serious would happen if the circuit drops out, then I would probably accept a loop or series d-c circuit.

But in any case, I would not forget the fact that if you have an awful lot of pipeline plant and investment depending on the communication system, and if you decide to go first class, you've got to pay first class fare to do it. ■

FCC overhauling rules and policies

By **NEIL REGEIMBAL**
Washington Bureau

THE Federal Communications Commission, in the first of several actions to modernize radio licensing, has drastically overhauled its policies and rules for industrial radio usage.

The changes are in the low and high frequency bands, but not in the microwave bands. A revision of microwave frequencies will be issued later.

Principal points of the revision include:

Reallocation of 6.5 mc of space in the 460-470 mc band from the citizens radio service to the industrial radio services. Some 2.4 mc of space in this band were retained for the citizens radio service, but most of this may be reallocated later.

Provision for the regular assignment of all industrial frequencies in the 450-470 mc band; reductions of channel spacing in the latter band and in the 27.23-27.28 and 162-174 mc bands; and apportions and reapportions frequencies among the several subservices comprising the industrial radio services.

Establishment of a new manufacturers radio service. The special industrial radio service is retained in substantially modified form. The low power industrial radio service, parts of the special industrial radio service, and parts of the citizens radio service are combined into a new business radio service.

In the frequencies most often used in the petroleum industry, the commission:

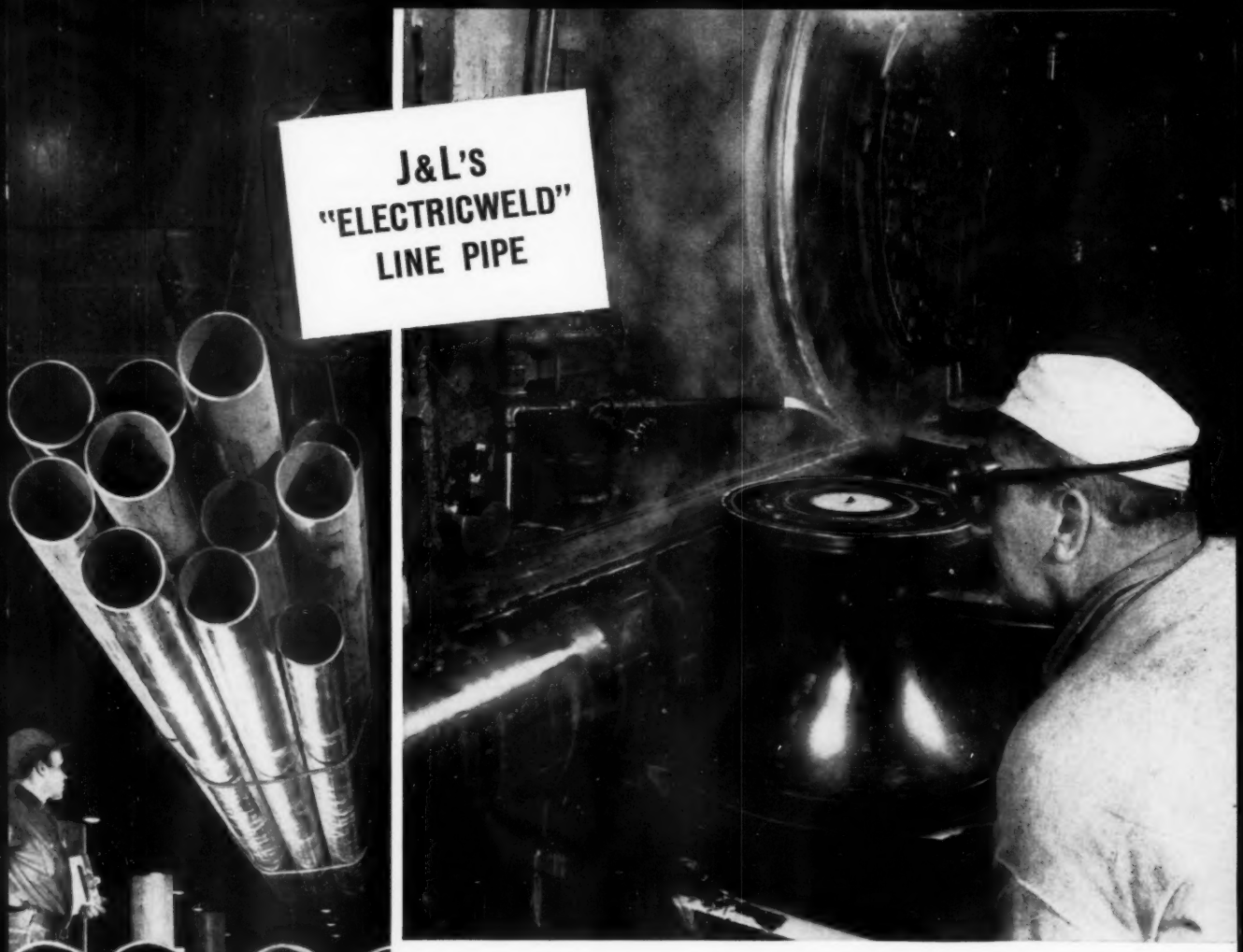
Permitted the forest products and the petroleum industries to share seven power radio splits the three 173 mc splits in Texas, Oklahoma, Louisiana, Arkansas, Washington, and Oregon. This will make the two services share all their frequencies above 40 mc.

As originally proposed, the petroleum and forest products industries were also given all of the 27.23-27.28 mc frequencies.

Reallocated the 19 frequencies available in the 450-460 mc band as follows: Four pairs for special industrial, and five pairs each for communications common carriers, power, and petroleum-forest products. The American Petroleum Institute had asked for at least 15 pairs in this frequency.

Most of the rest of the changes were adopted by the FCC as originally proposed (docket 11991) in April 1957.

Full text of the revision is available from the commission, Washington 25, D. C.



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pipeline news • *Cont'd.*

from page 136

many Chicago area customers presently on the waiting list. Some 185 MMcf/day will be available to Chicago and other regions served in seven states.

An amended application on this proposal was filed last April 3 seeking to speed up an original plan submitted a year earlier. Upon completion of construction, Natural's total delivery capacity will be increased by 35 per cent to about 730 MMcf/day.

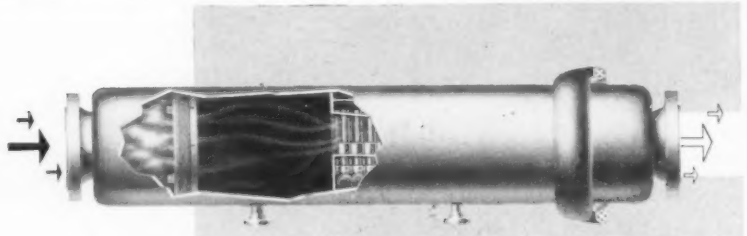
Mr. Bjork said construction will get under way this summer. "We hope to have . . . this project completed by next January with construction progress dependent upon pipe deliveries, availability of contractors, and the weather this fall . . . ."

NGPL has another expansion project for an additional 485 MMcf/day pending FPC approval. This plan was submitted in February 1956.

Texas Illinois Natural Gas Pipeline Co., another Peoples Gas subsidiary and builder of the 1200-mile line from the Gulf Coast, also has an expansion project before the FPC. This plan calls for bringing an additional 20 MMcf/day into the Chicago area.

In addition, Peoples Gas has an agreement with Midwestern Gas Transmission Co. for as much as 100 MMcf/day, this too awaiting FPC approval.

Mr. Bjork said a major portion of the supply for the authorized expansion will be obtained through the 350-mile line extension completed last December to Jack and Wise Counties, Texas, including gas purchased from Lone Star Gas Co., Dallas.



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Citizens Gas needs gas to relieve critical shortage

In an effort to get an additional 35 MMcf/day of natural gas by Nov. 1, Citizens Gas & Coke Utility, Indianapolis, has asked the FPC to order three transmission companies to supply the needed gas.

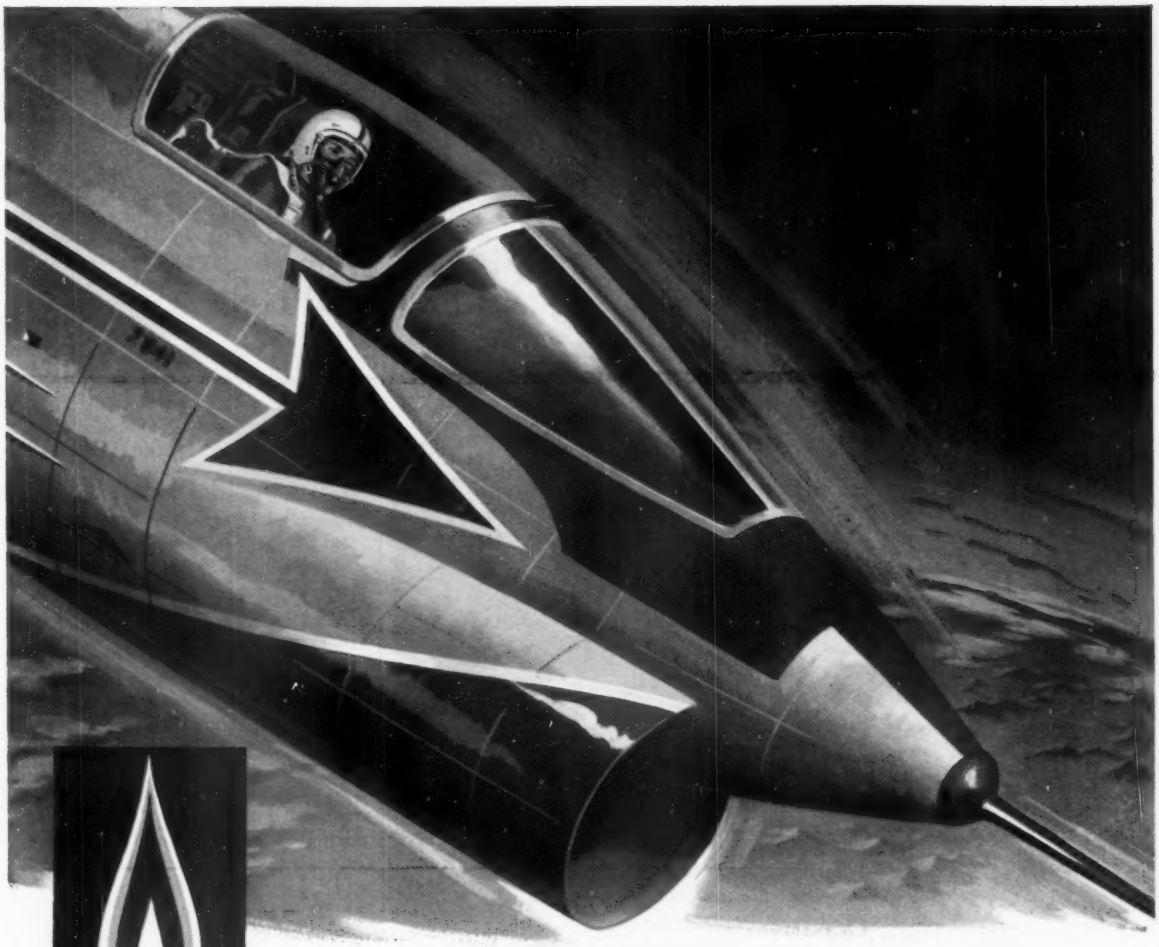
Citizens' application sets out its continuous efforts to obtain additional gas from Panhandle Eastern Pipe Line Co., its present supplier. The distributor seeks the gas from American Louisiana Pipeline Co., Texas Gas Transmission Co., or Panhandle. The proposals call for American Louisiana and Texas Gas, either separately or together, to supply the Indianapolis area, or for Panhandle increase its present supply from 44 MMcf daily.

In asking the FPC's help toward relieving a critical gas shortage, Citizens pledged its willingness to start additional pipeline construction of its own by Aug. 1. The company would pay the entire $2 million cost of the 21.7-mile, 20-in. line from Shelby county to an American Louisiana connection, or share with Texas Gas the $7 million cost of a 70-mile, 20-in. line to a connection in Lawrence County.

2 trillion cu ft reserves okayed for Transco

Although subject to commission review, sales of gas to Transcontinental Gas Pipe Line Corp. by 26 independent producers in fields in southern and offshore Louisiana have been authorized (Docket G-13169).

Presiding Examiner William J. Costello said that the gas reserves, estimated at about 2 trillion cu ft, would enable Transco to serve its



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present market requirements together with proposed new service (Dockets G-13590 and G-13745) until 1971 before it will experience an annual deficiency. Transco said that without the attachment of the new supplies, it would experience peak-day deficiencies of 116.8 MMcf in 1959 and 171.2 MMcf in 1961.

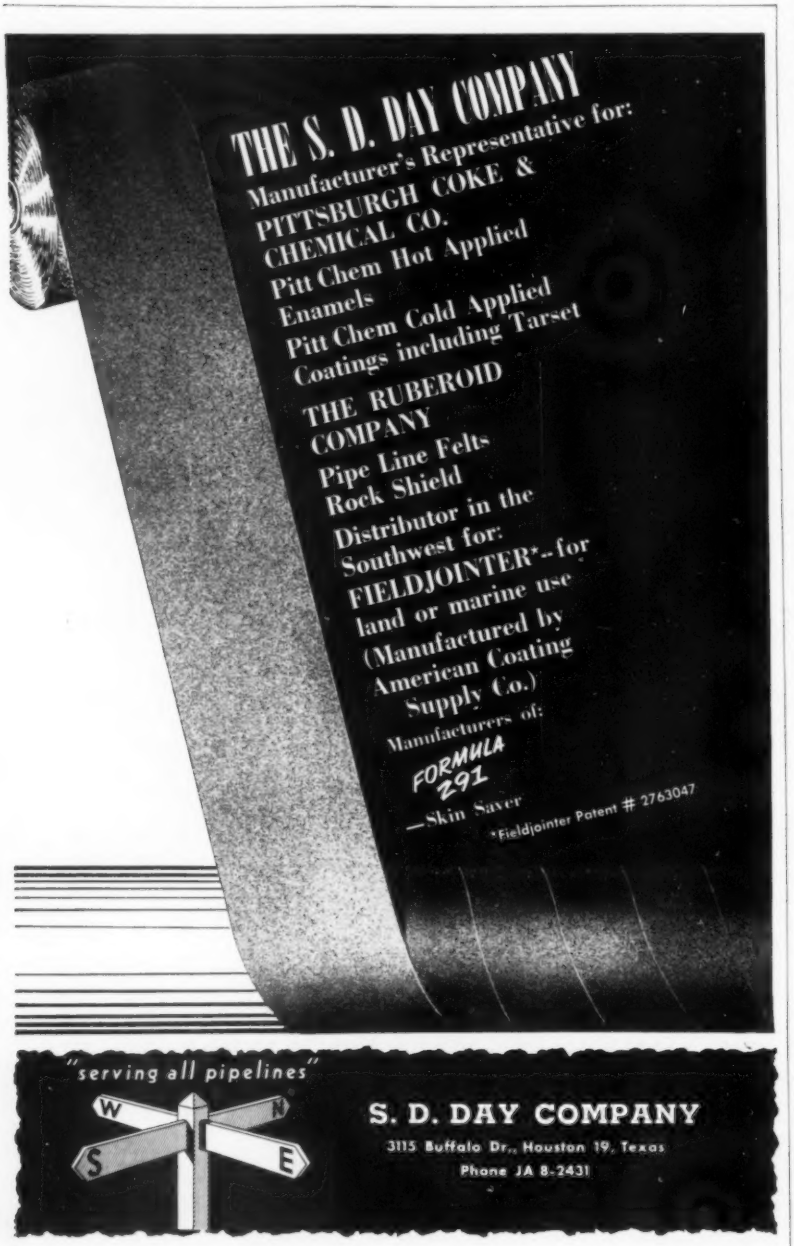
AmLa's increase okayed; ups system 35.7 MMcf

American Louisiana Pipe Line Co., Detroit, has a temporary certificate to increase its average daily system capacity by 35.7 MMcf to a total of 357 MMcf. The project, estimated to cost $7.4 million (Docket G-10396, 10400, and 11061), consists mainly of two new 12,000-hp compressor stations in Ohio and Indiana, and the addition of 2000 hp at two existing stations in Mississippi and Tennessee.

While issuing AmLa's certificate, the FPC presiding examiner turned down Panhandle Eastern Pipe Line Co.'s request to abandon its 127 MMcf/day sale to Michigan Consolidated Gas Co., Detroit. Michigan Consolidated, subsidiary of the American Natural Gas Co. system, secures gas supplies from its system affiliates, American Louisiana and Michigan Wisconsin, as well as from Panhandle.

In denying Panhandle's request, the examiner held that on the basis of the showing of requirements and of the gas available for the system, there would not be an adequate supply on a peak day or an annual basis if the Panhandle supply was withdrawn.

American Louisiana's application had proposed a two-step construction program. The new certificate covers only the first phase. The second step, on which the decision has been deferred, would add another 40 MMcf to AmLa's peak day sales capacity and would bring the total cost of the project up to $15 million.



Texas Gas plans looping

Texas Gas Transmission Co. plans to spend $20 million to increase the delivery capacity of its system by about 113 MMcf/day.

President of the Owensboro, Ky., company, W. M. Elmer, reports that gas reserves required for the increased capacity are already committed, and the sales by suppliers have been authorized by the FPC.

Pipeline and horsepower additions include 92 miles of 30-in., 19 miles of 26-in., and 15 miles of smaller diameter lines. Looping will be done along the system in Louisiana, Arkansas, Mississippi, Kentucky, Indiana, and Illinois.

Six existing compressor stations at Pineville, La.; Kenton, Tenn.; Calvert City and Slaughters, Ky.; and Dillsboro and Petersburg, Ind., will benefit from the addition of 9040 hp.

Southern seeks temporary

Southern Natural Gas Co. is seeking a temporary certificate for a substantial portion of the facilities it originally applied for under its proposed $64 million expansion project.

In the new application, Southern wants to build facilities to increase system delivery capacity to supply firm requirements of its present customers for the 1958-59 winter in areas now being served. Cost is estimated at $28.7 million. Southern said it wants to firm up its material orders and get construction under way in time to provide the service for the coming winter.

Underground storage okay

Ohio Fuel Gas Co., Columbus, has temporary authorization (Docket G-14269) to develop a natural gas storage field in Medina County, Ohio. Ultimate cost of the project, consisting of about 12 miles of 4.5- to 20-in. pipe and a 3300 hp compressor station, is $5 million.

Ohio Fuel owns the eight remaining active wells in the depleted Medina gas-producing area. They will be converted to storage service. Ultimate capacity is estimated at 8.5 billion cu ft and peak withdrawals will be in the range of 80 to 100 MMcf/day.

Cities Service gets line

Under recent authorization, Cities Service Gas Co., Oklahoma City, will acquire about 5.7 miles of 8-in. gas transmission line from Missouri Public Service Co., Kansas City. The FPC also exempted Missouri from regulation under the Natural Gas Act (Docket G-14534).

The 8-in. line extends from a point near Fort Scott, Kan., to a point in Missouri about 1 mile east of the Kansas-Missouri state line. Eighteen rural customers in Kansas, now being served by Missouri, will be served by Cities Service through the Gas Service Co., Kansas City, Mo., which purchases gas from Cities Service for distribution in Fort Scott.

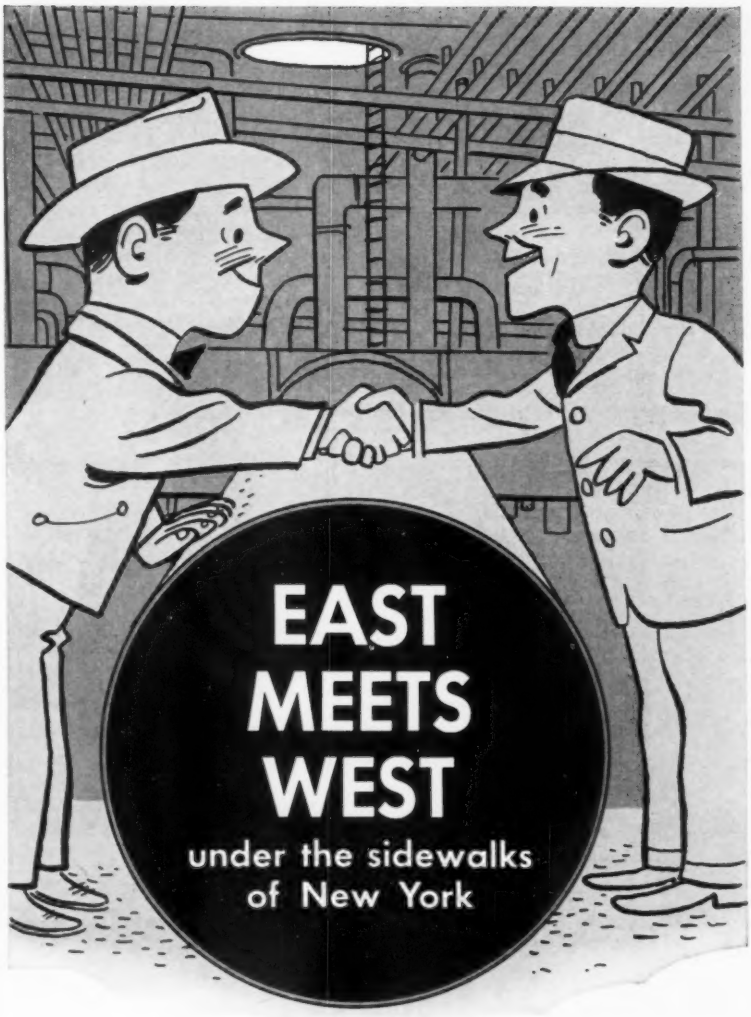
6-month loss for Westcoast

Westcoast Transmission Co. Ltd. showed a net loss of $2.5 million in its first six months of operation as a distributor of natural gas, President Frank M. McMahon reports.

Sales in British Columbia were below expectations due to several factors—including a mild winter—but now are reported on schedule. Mr. McMahon said, however, that "cash generated will more than provide for servicing of all expenses, interest and debt retirement."

GAS • Pipeline Notes

For the second time, the FPC has refused to consider separately the application involving the acquisition of interests in the Leidy gas field by Transcontinental Gas Pipe Line and Texas Eastern Transmission. The transmission companies propose to develop it as a natural gas storage pool in conjunction with



Natural gas consumers on the eastern seaboard never give a thought to the old maxim about that gap between East and West. Under their cities run dependable connecting pipelines to gas fields west of the distant Mississippi. Transco is privileged to take your gas where the most people are: through Transco the twain will always meet to their mutual advantage.

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the present owner, New York State Natural Gas Corp. (Docket G-13143, et al).

The constitutionality of Louisiana's new gas gathering tax will undoubtedly have to be decided by the courts. The bill, backed by Gov. Earl Long, calls for a 1-cent increase in the 1-cent/Mcf tax. It is estimated to bring in between $25 million and $30 million a year. It has been indicated that several gas producing and purchasing companies will challenge the bill's constitutionality.

Algonquin Gas Transmission Co., Boston, proposes (Docket G-14876) to construct a 4000-hp compressor station at Cromwell, Conn. The $1.7 million dollar job will provide an increased margin of safety between Algonquin's system requirements and system capacity.

New York State Natural Gas Corp., Pittsburgh, has an okay from the FPC to replace 12.9 miles of 12-in. line with 13 miles of 20-in. line in Potter County, Pa. Some $923,900 will be spent on the line, running between the company's Harrison compressor station and its State Line station.

The FPC has okayed Transcontinental Gas Pipe Line Corp.'s transportation service for Virginia Electric Power Co., Richmond (Docket G-12059, et al). The FPC presiding examiner also ordered Transco to sell and deliver winter peaking gas to Washington (D.C.) Gas Light Co. and Commonwealth Natural Gas Corp., also of Richmond. An application by Atlantic Seaboard Corp., Charleston, W. Va., to construct facilities to receive peaking gas service was denied.

Texas Gas Transmission Corp., Owensboro, Ky., plans to install about 12.5 miles of 16-in. loop line from the Lake Arthur field, Jefferson Davis Parish, La., to a point of interconnection with its 26-in. Eunice-Bastrop line near Eunice, La. In its application (Docket G-14763), Texas Gas said the proposed looping would provide greater assurance that it would be able to deliver required quantities of gas from the Lake Arthur area into its mainline system and would increase operating flexibility of its south Louisiana system.

Tennessee Gas Transmission Co., Houston, plans to build about 21 miles of 16- and 2 miles of 12.75-in. line in Louisiana to attach offshore reserves estimated at about 403 billion cu ft. Cost is estimated at $2.8 million (Docket G-14562).

The Government Printing Office has a revised edition of the FPC's pamphlet, "Rules of Practice and Procedure." The new indexed pamphlet contains the commission's rules of practice and procedure, including general policy and determinations, in effect May 1, 1958, and covers amendments through Order No. 194-A.

El Paso (Texas) Natural Gas Co. and Equity Oil have entered a memorandum agreement whereby Equity would supply El Paso with 100 MMcf of gas at the wellhead price of 16 cents/Mcf. The gas would be supplied from Equity's holdings in Piceance Creek basin in northwest Colorado.

Columbia Gas System Inc. has formed a new company. It is Columbia Gulf Transmission Co., which contemplates acquiring Gulf Interstate Gas Co.

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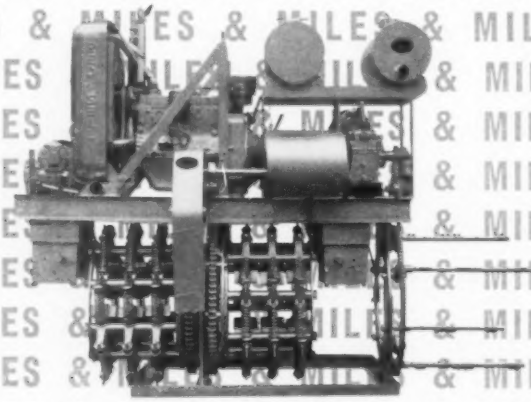

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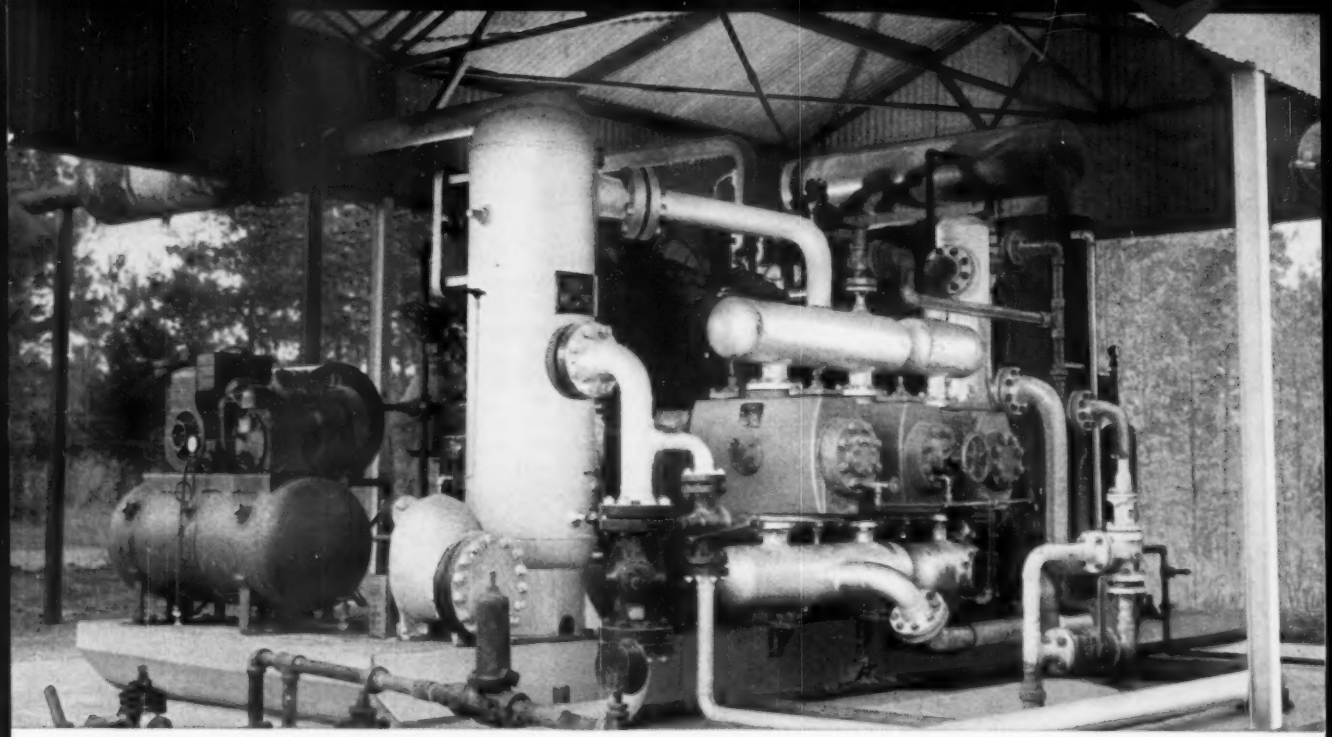

UNION PRODUCING COMPANY, ET AL. HULL STATION—equipped with a Beaird-Ingersoll-Rand 165 h.p. 6JVG Packaged Compressor. Unit has a Young Radiator with gas interstage, lubricating oil and engine cooling sections. Other Beaird compressors from 120 to 660 h.p.

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Union Producing Company, et al., installed their Hull station in 1953 to boost gas in the Carthage Field. Consisting of one Beaird-Ingersoll-Rand 6JVG, 165-h.p. packaged compressor, the station handled 5.9 MMcfd with suction at 800 psig and discharge at 1300 psig.

During five years of production field pressures steadily declined until the original compressor could no longer operate efficiently. Rather than install a new unit it was determined that field conversion of the present compressor to two-stage operation would prove equally effective. This was quickly and economically done in the field. Two 7½-inch cylinders were placed on the first compression stage and a 5-inch cylinder on the second stage. Interstage gas cooling was provided by adding a gas coil at the front of the existing radiator. A scrubber for the second stage was installed and clearance bottle connections were provided on all cylinders.

The unit is now back in operation handling 2.5 MMcfd with suction at 100 psig and discharge at 300 psig. This field conversion will enable the unit to operate fully loaded down through final production of the field.

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Niagara Mohawk Power Corp., Syracuse, is installing a 40-mile, 24-in. line to serve central and northern New York. The four-county span will cost $3.5 million.

Construction of about 51 miles of line on various parts of Ohio Fuel Gas Co.'s transmission system in Ohio has been okayed by the FPC in Docket G-14766. Also authorized is the abandonment of about 39 miles of line. The $2.1 million project will be located in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne Counties.

Another Columbia Gas System subsidiary, United Fuel Gas Co., Charleston, W. Va., also received FPC authorization of a $1.5 million construction job (Docket G-12295). United will activate an additional underground storage pool in the Big Sandy district of Kanawha County, W. Va. Maximum storage capacity of the pool is estimated at 14.8 MMcf above the native reserves still in place, which are estimated to total about 5.3 billion cu ft.

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John B. Hussey has taken the oath of office as a member of the Federal Power Commission for a five-year term. He succeeds Seaborn L. Digby, who left the FPC on June 22.

Trunkline Gas Co. is building a six-story office building in Houston. Total available floor space in the gas air conditioned structure will be 74,000 sq ft. Movable partitions in the office working area will provide for flexibility of office arrangement.

Research and development workers of El Paso (Texas) Natural Gas Co. have moved into their new research laboratory just completed near Texas Western College. The $200,000 building will be used as a joint program by El Paso and the college. New equipment includes a spectrophotometer, a device for analyzing natural gas and natural gas liquids.

Washington • *Cont'd.*

from page 17

bying are as much a part of the American business scene as are the company picnic, the house organ, and community relations programs, opponents insist.

The bills are being touted as necessary to protect the consumer, but are in reality designed to win a political victory through legislation in the private-vs-public power fight.

The expected liberal shift in the nation's legislature can also be expected to increase the pressure on the Federal Power Commission for more restrictive controls of the gas industry.

And the FPC in recent months has shown little shyness in exercising its control powers.

The prospect of this liberal shift is already causing some concern among backers of the natural gas bill. They are reportedly planning to reintroduce legislation similar to the Harris-O'Hara bill again next year. But they fear that it may again be doomed unless a tremendous public relations job is accomplished between now and next spring when the voting on such bills will begin.

Meanwhile, FPC has granted temporary permission for Natural Gas Pipeline Co. of America, Chicago, to construct an $84.6 million, 490-mile line from Texas to Joliet, Ill. This is the first major project to work around the restricting effects of the Memphis decision.

GAS distributors, as well as pipelines and producers, are going to be paying higher prices for pipe and other steel goods and equipment. Price increases in steel products, and those of other metals too, are inevitable.

By the time these increases reach the ultimate users of pipe and products, the hike will probably be 5 per cent or more of delivered cost, industry experts say.

Steel price increases were delayed past their scheduled July 1 date. But they'll come, probably before Sept. 1. On the average, the increase will be a little less than 5 per cent, or around $6 for an average ton of steel ingot.

It'll take awhile before this increase shows up. *It'll come first in line pipe prices.* Some gas and oil equipment producers indicate they'll try to absorb the increase, for awhile anyway, to try and minimize adverse reaction from their customers.

Over the long run, the increase will have to be passed on. And like most price hikes in raw materials, the increase will be "pyramided" by everyone handling it—a $6 a ton hike in the price of steel is passed on as a percentage of cost by everyone handling it. Eventually it becomes more than 5 per cent of the price of the finished article.

Allowing for some marginal suppliers absorbing part of the increase in order to hold business, the net result to consumers in the gas industry is figured to be at or slightly higher than 5 per cent by steel industry experts.

Pipe price increases will add to the generally depressing effects in the gas industry of the Memphis decision, the failure of Congress to act on the natural gas bill, and a recession in the demand for petroleum, all of which have for the past several months tended to hold down new gas production and may in the long run push gas prices higher.

If the home building boomlet expected to start this summer and fall does materialize, these situations could cause some trouble for expanding distributors. ■

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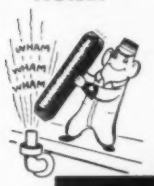

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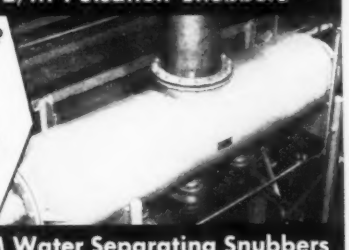

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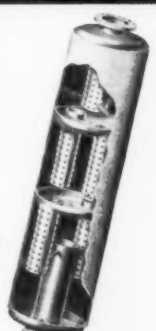

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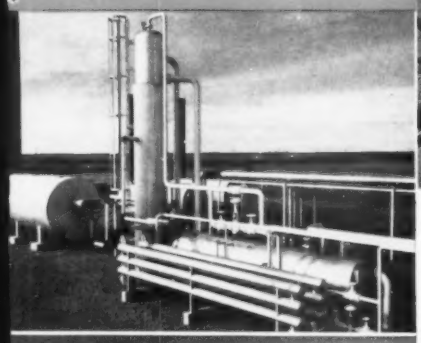

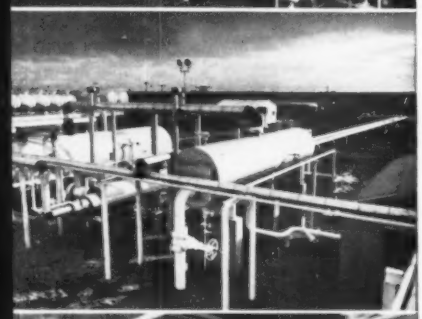

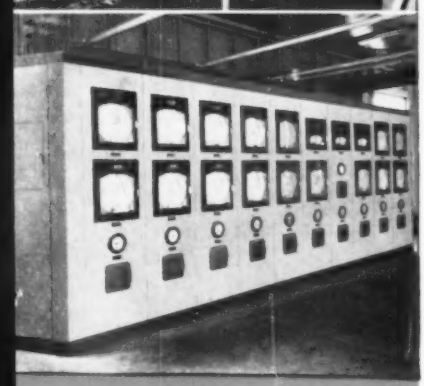

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iC_4	0.34
NC_4	0.57
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